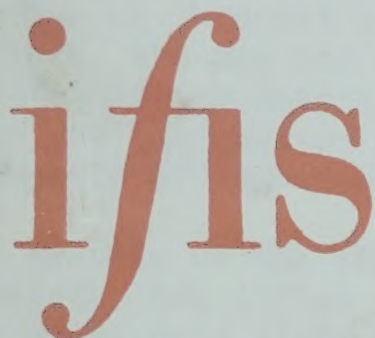


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FAB 4

TECHNIQUES FOR ANALYSIS OF FLAVOUR VOLATILES

SELECTED FROM VOLUME 8

FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

under the direction of

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Institut für Dokumentationswesen, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen; Zentralstelle für maschinelle Dokumentation—Frankfurt am Main.

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H. BROOKES
ASSISTANT EDITOR

1

The role of sulfur compounds in food flavor.**I. Thiazoles. [Review]**

Maga, J. A.

CRC Critical Reviews in Food Science and Nutrition 6 (2) 153-176 (1975) [49 ref. En]
[Dept. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado, USA]

Topics discussed in this review are: occurrence of thiazoles in meat products, potato products, nut products, popcorn, alcoholic beverages, milk products, tomato products, and other foods (e.g. cocoa, coffee); formation pathways; isolation and identification techniques; methods of synthesis; and sensory properties. JA

2

Gas-liquid chromatography of terpenes. [Review]

Rudloff, E. von

Advances in Chromatography 10, 173-230 (1974)
[370 ref. En] [Prairie Regional Lab., Nat. Res. Council of Canada, Saskatoon, Saskatchewan, Canada]

3

Porous-layer open tubular columns - theory, practice, and applications. [Review]

Ettre, L. S.; Purcell, J. E.

Advances in Chromatography 10, 1-97 (1974)
[136 ref. En] [Perkin-Elmer Corp., Norwalk, Connecticut, USA]

4

Computer derived perceptual maps of flavors.

Moskowitz, H. R.; Sydow, E. von

Journal of Food Science 40 (4) 788-792 (1975) [9 ref. En] [US Army Natick Lab., Natick, Massachusetts 01760, USA]

Profiles of the flavour of 4 juices (cranberry, blueberry, grape, apple) with different levels of added sucrose (in cranberry and blueberry juice) were obtained from panellists and analysed by multidimensional scaling. Panellists evaluated these juices using 22 aroma descriptors and 10 taste descriptors. Multidimensional scaling embedded both descriptor terms and juices into a 2-dimensional geometrical space, and simultaneously revealed relations among descriptors, among juices, and between descriptors and juices. An additional multidimensional scaling procedure, developed specifically to analyse individual differences (INDSCAL), revealed that, for evaluation of grape juice, panellists utilized 2 major 'dimensions', good-bad and relevant vs. irrelevant. Panellists agreed on the use of good-bad descriptors, but differed in the way they conceptualized insistent vs. vague attributes. The same analysis revealed that panellists evaluated flavour of apple juice consistently across a 16-day period. The methods provide a new, powerful approach for understanding panellist's responses to perceptual characteristics of flavour. IFT

5

[New methods for the evaluation and the analysis of organoleptic qualities of foodstuffs and for the forecast of their changes. VIII. Changes in the original flavouring substances during the heat treatment and storage of apple juice.] Neue Methoden der Be- und Auswertung sensorischer Eigenschaften von Lebensmitteln und der Berechnung ihrer Veränderungen. VIII. Veränderungen ursprünglicher

Apfelsaftaromastoffe während der Erhitzung und Lagerung von Apfelsaft.

Herrmann, J.; Poeschel, W.

Nahrung 19 (5/6) 401-409 (1975) [28 ref. De, en, ru] [Sektion Nahrungsgüterwirtschaft und Lebensmitteltech., Humboldt-Univ., Berlin (GDR)]

Gas chromatographic and sensory studies on changes in juice of Ontario and Gelber Köstlicher var. apples during holding for ≤ 10 h at 78°C or ≤ 360 h at 48°C are described. Graphs are given showing changes in the peak area of various volatile fractions during holding. The aroma components 'apple-aromatic' and 'grass-like' decreased with increasing duration of heat treatment; dilution studies and studies on blends of intensively heat-treated juice with mildly heat-treated juice showed that this apparent decrease was, in fact, due to masking of these aroma components by the newly-formed aroma component 'cooked aroma'. The furfural content of the juice increased with increasing intensity of heat treatment. Correlation coeff. of furfural content with 'cooked odour' 'apple-aromatic aroma' and 'fruity aroma' were, respectively, 0.781, -0.889 and -0.773. It is concluded that furfural concn. is a useful indicator of thermal deterioration of the organoleptic properties of apple juice. [See FSTA (1974) 6 3A117 for part VII.] AJDW

6

Tea flavoring agent.

Reymond, D.; Marion, J. (Societe d'Assistance Technique pour Produits Nestle SA)

United States Patent 3 873 752 (1975) [En]

An organic solvent solution of aromatic tea leaf constituents, including those of unpleasant flavour, is mixed with an aqueous alkaline solution for removal of the undesirable constituents. IFT

7

[Freeze concentration of apple juice and apple juice aroma by the Gresco process.]

Gefrierkonzentrierung von Apfelsaft und Apfelsaftaroma nach dem Gresco-Verfahren.

Dürr, P.; Schobinger, U.; Pelt, W. H. J. M. van

Alimenta 14 (4) 107-113 (1975) [13 ref. De, en] [Eidgenössische Forschungsanstalt für Obst, Wein- und Gartenbau, CH-8820, Wädenswil, Switzerland]

In the Gresco freeze concn. process large spherical ice crystals are formed in the crystallization section with a very small degree of supercooling. No concentrate is trapped in the ice. The ice is removed in a wash column without loss of concentrate. Apple juice can be conc. up to 50°

Brix, but this process is uneconomic. By combining the freeze concn. of the aroma and the evaporation of the stripped juice, a better final product can be obtained. Costs are about 30% higher than with an actual concn. process by evaporation and aroma distillation. The freeze concn. process and experiments with apple juice and apple juice aroma are described, including an estimation of production costs. AS

8

Identification of the major volatile components of blueberry.

Parliment, T. H.; Kolor, M. G.

Journal of Food Science **40** (4) 762-763 (1975) [5 ref. En] [General Foods Tech. Center, White Plains, New York 10625, USA]

The volatile constituents of high-bush blueberries (*Vaccinium corymbosum*), obtained by distillation-extraction of the fruit, were separated by gas chromatography and subjected to IR and mass spectral analysis. The predominant feature of this fruit is the variety and concn. of the 6-C compounds which include both saturated and unsaturated alcohols and aldehydes such as hexanal, trans-2-hexenal, hexanol and the trans-2- and cis-3-hexenols. Also identified are a number of terpene alcohols including the geraniol isomers, α -terpineol and linalool, as well as ethyl acetate, ethyl isovalerate, limonene and some commonly occurring alcohols. Relative concn. are given and the organoleptic importance of the identified components is discussed. IFT

9

Influence of cellulose and starch on the retention of volatiles during freeze-drying of a liquid extract of mushroom.

Bartholomai, G. B.; Brennan, J. G.; Jowitt, R.

Lebensmittel-Wissenschaft + Technologie **8** (4) 174-176 (1975) [10 ref. En] [Nat. Coll. of Food Tech., St. George's Avenue, Weybridge, Surrey KT1 30DE, UK]

The retention of benzaldehyde in freeze-dried suspensions of mushroom liquid extract containing starch or cellulose was studied. Among the variables affecting the retention level are concn. of solids and initial concn. of aldehyde in the suspension. The inclusion of polymeric substrates like starch or cellulose in mushroom liquid extract does not play an important role in volatile retention during freeze-drying. The lack of changes in levels of retention observed with cellulose and starch may be explained on the basis of the low mobility of the chains as compared with other carbohydrates or polymeric materials. AS

10

Quantitative recovery of volatiles from fats and oils by combined high vacuum degassing and thin film molecular distillation.

Brandt, P. E.; Jensen, B. H.

Journal of the American Oil Chemists' Society **52** (8) 278-281 (1975) [6 ref. En] [A/S Grindstedvaerket, Edwin Rahrs Vej 38, DK-8220 Brabrand, Denmark]

An apparatus is described which in one unit combines conventional high vacuum degassing on cold finger with falling film molecular distillation. The upper part of the cold finger is for the collection of the most volatile substances, while the lower part is for the condensing of substances which are molecular distilled from a wiped falling film. All the connections in the glass apparatus are made from Teflon or Viton-O-rings, and the turning of the rotor in the molecular distillation part is carried out by means of magnetic coupling. In this way, the risk for contamination is reduced greatly. As all volatile substances after the treatment of the oil are on the same cold finger, the collection can be made by a high vacuum distillation into a small glass chilled with liquid N. In the bp range of 40-450°C, the apparatus gives recoveries of volatiles in or below the ppm range between 71-114% with coeff. of variance between 5-23%. The recoveries are found with internal standards added before treatment of the oil. Below 70°C, the recoveries drop to some extent. The volatiles are substances with different kinds of functional groups, e.g. hydrocarbons, aldehydes, ketones, acids, esters, lactones, and S containing substances. AS

11

Identification of volatile flavor compounds developed during storage of a deodorized hydrogenated soybean oil.

Yasuda, K.; Peterson, R. J.; Chang, S. S.

Journal of the American Oil Chemists' Society **52** (8) 307-311 (1975) [9 ref. En] [Dep. of Food Sci., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

The volatile compounds from soybean oil (hydrogenated to I value 58.5; 51.5% trans isomers; free of antioxidant), which had been aged at 85°C for 3 wk to develop an objectionable hydrogenation flavour, were studied. Steam-distilled non-acidic volatiles were fractionated by gas chromatography and fractions identified by IR and mass spectrometry. 48 compounds were identified from the material having the characteristic odour. 6-trans-nonenal, 2-trans-6-trans-octadienal and higher alcohols and lactones were considered to be the contributors to the hydrogenation flavour. JRR

12

Identification of the volatile constituents of the Egyptian lemongrass oil. III. Infrared spectroscopy. Foda, Y. H.; Abdallah, M. A.; Zaki, M. S.; Mostafa, M. M.

Nahrung 19 (5/6) 395-400 (1975) [7 ref. En, de, ru] [Fac. of Agric., Ain-Shams Univ., Cairo, Egypt]

IR spectroscopic studies on changes in lemongrass oil during storage are described. Storage conditions tested included: storage for 4 months exposed to the air; storage for 4 months at room temp., in brown or transparent bottles; and storage for 4 or 6 months at 5°C in brown or transparent bottles. Selected IR spectra for fresh and stored samples are given, and the wave numbers of the principal peaks are presented in tabular form. The results are discussed in detail, with special reference to effects of storage conditions on changes in the concn. of various fractions (hydrocarbons, carbonyl compounds, hydroxy compounds, linalool derivatives, ethylene oxide, alcohols, citral) in the oil. [See *FSTA* (1975) 7 9T430 for part II.] AJDW

13

A new technique for trapping and sensory evaluation of flavour volatiles.

Clark, R. G.; Cronin, D. A.

Journal of the Science of Food and Agriculture 26 (7) 1009-1019 (1975) [13 ref. En] [Procter Dep. of Food and Leather Sci., Univ., Leeds LS2 9JT, UK]

Procedures are described whereby volatile components of flavour concentrates may be trapped upon elution from either packed or capillary gas chromatographic columns on short lengths of glass porous layer open tubular (PLOT) capillaries containing a layer of alumina or Celite 545. The trapped compounds are subsequently released and their aromas evaluated by grinding up the traps in a small quantity of water. Using a multicomponent 'synthetic essence' the best results for the combined trapping and release of compounds were obtained with capillaries containing acid-washed Celite 545. Although the technique is complementary to the conventional method of 'sniffing' eluted peaks it is considerably more versatile than the latter, as it may be used to assess the sensory properties of different separated regions of complete chromatograms after recombination and thus detect interactive and blending effects. AS

14

[Possibilities of error in the determination of volatile sulphur compounds.] Fehlermöglichkeiten bei der Bestimmung flüchtiger Schwefelverbindungen.

Gruss, R.; Niefind, H.-J.

Brauwissenschaft 28 (8) 228-230 (1975) [7 ref. De, en, fr] [Binding-Brauerei AG, Frankfurt/Main, Federal Republic of Germany]

Studies on possible interference of S-compounds released from bottle closures with detn. of S-compounds in beer headspace by GLC are

described. Release of S-compounds by 8 natural and synthetic rubber serum bottle septa, 2 GLC septa and 3 PVC inserts for crown-closures (held for 30 min at 35°C or 80°C) was studied; a table of results is given. All closures except a silicone rubber GLC septum and a PVC crown closure insert released carbonyl sulphide and/or an unidentified compound with a retention time equal to that of ethyl mercaptan or carbon disulphide. A natural rubber serum bottle septum released very low concn. of carbonyl sulphide, and did not release the unidentified compound. Effects of PVC inserts for crown closures and natural rubber, butyl rubber and silicone rubber (with or without a teflon coating) septa on carbonyl sulphide, ethyl mercaptan, dimethyl sulphide, diethyl sulphide and dimethyl disulphide concn. in beer headspace were studied. A table of results is given. The results confirmed that natural rubber septa or crown closures with PVC inserts are the best closures for use in beer headspace analyses. Recommendations for headspace sampling methods are given. It is concluded that previous suggestions that traces of carbonyl sulphide in beer are formed during heating or by microbial metabolism are erroneous. AJDW

15

[Study of an aroma fraction characteristic of Cabernet Sauvignon grape variety; identification of 2-methoxy-3-isobutyl-pyrazine.]

Bayonove, C.; Cordonnier, R.; Dubois, P.

Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, D 281 (1) 75-78 (1975) [20 ref. Fr] [Sta. de Tech. Vegetale, Centre de Recherches INRA, Place Viala, 34060 Montpellier Cedex, France]

A volatile characteristic odour fraction was extracted from this grape var. and analysed by gas chromatography and MS. It was found to be composed of several substances, of which n-octanol and 2-methoxy-3-isobutylpyrazine were identified. AL

16

[Effect of fermentation method and yeast strain on the volatile content of beer.]

Tsankova, E.; Kostov, V.; Goranov, N.

Khranitelna Promishlenost 24 (5) 24-26 (1975) [3 ref. Bg]

The yeast strains used were Pilsen-G (flocculating) and Heineken (weakly flocculating). Fermentation was carried out under enclosed conditions, with and without a pressure of 1.0-1.2 atm, and at temp. of 8-9°, 11-12° and 15-16°C. The volatile aroma compounds in the finished beer were determined by gas chromatography, using Carbowax 20 as the active phase. The contents of volatiles were less in the beer produced under pressure than in that produced without pressure; in both cases, an increase in temp. led to an increase in volatiles content; and the flocculating strain produced higher volatiles levels than the weakly flocculating strain. HBr

17

Flavor chemistry of beer. I. Flavor interaction between principal volatiles.

Meilgaard, M. C.

Technical Quarterly, Master Brewers Association of America 12 (2) 107-117 (1975) [79 ref. En, es] [Stroh Brewery Co., Detroit, Michigan, USA]

Significant flavour interactions were observed between various aroma volatiles added to beer. In mixtures of fusel alcohols, the flavour of iso-amyl alcohol is somewhat repressed whereas the rose flavour of 2-phenylethanol is enhanced by the other alcohols. The C-6 to C-10 acids are additive while acetic, butyric and isovaleric acids are perceived almost independently from these and from each other. The 'banana esters' are additive and the same is true of the 'apple esters' which perhaps show some slight synergism. Esters of different types are only partly additive, and partly independent. As a general rule, substances of like flavours are additive while those of widely different flavours are independent; substances with partly similar flavours are partly additive. At the level of sub-threshold interaction, strong synergism and antagonisms are absent, those found amounting to <50% increase or decrease in the flavour strength of any given compound. AS

18

Flavor components in Vietnamese green tea and lotus tea.

Nguyen, T.-T.; Yamanishi, T.

Agricultural and Biological Chemistry 39 (6) 1263-1267 (1975) [2 ref. En] [Lab. of Food Chem., Ochanomizu Univ., Tokyo, Japan]

Aroma concentrates from Vietnamese green tea and lotus tea were prepared and analysed. Characterization of the components was carried out using coupled gas chromatography and MS and IR spectrometry, and gas chromatographic retention data. Anethole and 1,4-dimethoxybenzene were identified for the first time as flavour constituents in green tea. Linalool, 2 linalool oxides (cis and trans, 5-membered), 3,7-dimethyl-1,5,7-octatriene-3-ol, 2,5 (or 2,6)-dimethylpyrazine and 1-ethyl-2-formylpyrrole were the predominant components in Vietnamese green tea. 1,4-Dimethoxybenzene was identified as the main component in lotus tea. The compound was also isolated from both dried and fresh lotus pollen. AS

19

Separation and quantification of some low-volatile compounds and their importance to the flavor character of beer.

Davis, D. P.; Palamand, S. R.; Hardwick, W. A.

Proceedings, American Society of Brewing Chemists 32 (2) 52-54 (1974) [7 ref. En] [Anheuser-Busch Inc., St. Louis, Missouri, USA]

It is believed that low-volatile compounds in beer have an important influence on its flavour properties, and could be used to characterize individual beers. A method of analysis is described

in which the medium-high bp compounds are extracted from beer into CS₂ and examined by gas chromatography. Typical chromatograms showed 11 peaks, of which 7 have been measured quantitatively and identified as ethyl caprylate, ethyl caprate, phenylethyl acetate, phenylethyl alcohol, caprylic acid, capric acid and lauric acid. Data are presented showing the concn. of the 7 compounds in 6 domestic and 9 foreign beers, in 4 beers of the same brand produced at different plants, and at processing stages (hopped wort, primary fermentation, secondary fermentation, finished beer). The concn. varied very widely between different beers, including the 4 from different plants, and correlations are shown between concn. of different compounds and particular flavour descriptions recorded by a taste panel. Concn. of the 7 compounds reached a max. level at the end of primary fermentation; thereafter capric and lauric acids decreased. High concn. of caprylic, capric and lauric acids or their esters were associated with beer flavours described as harsh, grainy or bitter. ELC

20

Some neutral aroma components of wines of *Vitis vinifera* variety Carignane.

Sakato, K. H.; Hockman, M.; Kepner, R. E.; Web, A. D.; Muller, C. J.

American Journal of Enology and Viticulture 26 (2) 70-74 (1975) [14 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California, USA]

A methylene chloride extract of a young, glass-only-aged wine was found to contain the following volatile aroma compounds: 3-methyl-1-butanol, 3-methyl-1-pentanol, ethyl lactate, ethyl 3-hydrobutyrate, L-2,3-butanediol monoacetate, diethyl succinate, ethyl 4-hydroxybutyrate, diethyl malate, ethyl 2-hydroxy-3-phenylpropionate, γ -butyrolactone, 4-carboethoxy-4-hydroxybutyric acid γ -lactone, 4R:5R and 4S:5S 4,5-dihydroxyhexanoic acid γ -lactone, and 4R:5S and 4S:5S 4,5-dihydroxyhexanoic acid γ -lactone. A volatile component, identified for the first time from wines by IR and MS and by coincidence of gas chromatographic retention times, is 3-hydroxy-4-phenylbutan-2-one. A number of substances present in trace amounts and the isolated acids were not identified. AS

21

New volatile constituents of black tea aroma.

Vitzthum, O. G.; Werkhoff, P.; Hubert, P.

Journal of Agricultural and Food Chemistry 23 (5) 999-1103 (1975) [31 ref. En] [Res. Lab., HAG AG, Bremen, Federal Republic of Germany]

The volatile components of black tea were isolated by extraction with supercritical CO₂ under pressure followed by atmospheric steam distillation and enrichment of steam volatiles on Porapak Q. The total black tea aroma fraction was separated into basic and neutral components. A total of 56 constituents, mainly pyridines, pyrazines,

quinolines, thiazoles, aromatic amines, and carbonyls, were identified for the first time in black tea aroma by using a combination of glass capillary gas chromatography and MS. Identifications of the new compounds were accomplished by comparison of their mass spectra measured on the same instrument and with mass spectral data given in the literature. GLC retention times were used to confirm identifications. AS

22

[Aroma of *Vaccinium* spp. berries.]

Anjou, K.

SIK Rapport No. 363, 31pp. (1974) [18 ref. Sv, en] [Swedish Inst. for Food Preservation Res. (SIK), Fack, S-400 21 Göteborg 16, Sweden]

GC-MS studies on volatiles in juice and press residue from (i) lingonberries (*Vaccinium vitis-idaea*), (ii) cranberries (*V. macrocarpon*) and (iii) bilberries (*V. myrtillus*) are described. Total volatile compounds concn. in press residues of (i), (ii) and (iii) were, respectively (ppm) 9, 9 and 25; corresponding values for the juices were 6, 10 and not given. 102 volatiles were identified in (i), 107 in (ii) and 109 in (iii). 2-methylbutyric acid predominated in (i), comprising 50% of the volatile fraction. In (ii) α -terpineol predominates, comprising 25% of the volatile fraction in the press residue and 34% in the juice. No compound clearly predominated in (iii); one GLC fraction (containing trans-2-hexenal, ethyl 3-methylbutyrate and ethyl 2-methylbutyrate) had the characteristic (iii) aroma. Organoleptic studies were conducted on solutions of these 3 compounds in deodorized (iii) juice. A mixture of these 3 compounds could be prepared giving a similar aroma to natural (iii) juice.

AJDW

23

[Studies on orange essential oils. I. Analysis by infrared spectroscopy.]

Carmona, P.; Bellanato, J.; Hidalgo, A.

Annales de Technologie Agricole 24 (1) 83-98 (1975) [13 ref. Fr, en, de, it] [Inst. d'Optique Daza de Valdes, CSIC, Serrano, 121 Madrid, Spain]

The composition of 19 commercial samples of sweet orange oil from various regions was studied by IR spectroscopy. Three samples were previously separated by column chromatography in order to obtain less complicated mixtures. A spectroscopic method is given for the quantitative determination of limonene. The results obtained by IR spectroscopy were confirmed by gas chromatography. AS

24

[Relationships between IR bands of compounds in citrus essential oils and the relative structure. I.]

Bocca, B. U.; Carretto, M.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 56 (12) 747-748 (1974) [6 ref. It, fr, en, de]

25

[Composition of cocoa aroma.] Über Kakaoaroma und seine Zusammensetzung. In '1st International Congress on Cocoa and Chocolate Research' [see FSTA (1976) 8 2K6]. [Lecture]

Landschreiber, E.; Mohr, W.

pp. 124-134 (1974) [29 ref. De] [Inst. für Lebensmitteltech. und Verpackung eV, Munich, Federal Republic of Germany]

The present state of knowledge on cocoa aroma is reviewed and various classifications of the 310 known aroma components are reproduced. Comparison with other foods showed the importance of heterocyclic compounds, especially pyrazines. The effects of individual components, 'chocolate-like' flavours, flavour reinforcers, and the detection of flavour changes during processing are discussed. The specific components responsible for the characteristic cocoa aroma have not yet been identified. For practical purposes, sensory aroma evaluation is still the method of choice. [See 8 2K6.] RM

26

[Extraction and concentration of volatiles from cereals, for analysis by gas chromatography.]

Richard-Molard, D.; Drapron, R.

Annales de Technologie Agricole 24 (1) 65-74 (1975) [7 ref. Fr, en, es, it] [Sta. de Biochimie et Physico-chimie des Cereales, ENSIAA, INRA, 91300 Massy, France]

After a brief review of the limitations of existing methods for extraction and concn. of volatiles from grain, details are given of a new method. Grain is precooled to 0°C, and comminuted in a Waring Blendor. Volatiles are separated by desorption under vacuum at 60°C, condensed, and extracted from the condensate with methylene chloride. The extract is then concn. by evaporation; in model studies, recoveries of $\leq 95\%$ were observed. The concn. extract may be stored in sealed glass tubes for several months before analysis by GLC. Application of this method to early detection of microbial spoilage of stored grain is discussed. AJDW

27

[The flavour of cheese. III. Minor constituents of Camembert aroma.]

Moinas, M.; Groux, M.; Horman, I.

Lait 55 (547) 414-417 (1975) [4 ref. Fr, en] [Societe d'Assistance Technique pour Produits Nestle SA, Case Postale 1009, CH-1001 Lausanne, Switzerland]

Approx. 30 samples of Camembert were analysed, using methods of extraction, enrichment and combined gas chromatography/mass spectrometry previously described [FSTA (1974) 6 4P598, 6P869]. The following minor volatile constituents were identified in the aromatic extract (approx. concn. in mg/g of extract in parentheses): toluene (<1); ethylbenzene (10); 2-nononone (50);

methyl furyl ketone (3); thiophene 2-aldehyde (4); propiophenone (2); naphthalene (<1); β -phenylethyl acetate (4); phenylacetonitrile (4); β -phenylethyl butyrate (1); and methyl cinnamate (50). Their role in Camembert flavour is discussed. ADL

28

Volatile carbonyls in fresh and stored desi ghee.

Gaba, K. L.; Jain, M. K.

Indian Journal of Animal Sciences 44 (5) 311-318 (1974) [15 ref. En] [Nat. Dairy Res. Inst., Karnal, Haryana, India]

Total volatile carbonyl (TVC) contents of fresh cow and buffalo ghee (8 samples each) were respectively 0.33 and 0.26 $\mu\text{mol/g}$ fat. All ghee samples developed slight off-flavours after 100 days storage at 37°C, and even more marked deterioration in flavour was evident after 200 days. During this 200-day storage period, TVC content of the ghee increased to 1.25 $\mu\text{mol/g}$ fat in cow ghee and to 1.41 $\mu\text{mol/g}$ fat in buffalo ghee. A total of 34 carbonyls were identified by TLC and GLC analysis of the ghee samples. The relative proportions of individual carbonyls in fresh and stored samples are tabulated in detail. Monocarbonyls in fresh ghee consisted of approx. 90% alkan-2-ones. On storage, although no new carbonyls were detected, there was a marked increase in the alkanals, alk-2-enals and alka-2,4-dienals, which may be the reason for the deterioration in ghee flavour during storage. MC

29

The flavor substances of 'nori', the dried laver *Porphyra tenera*. I. Dimethyl sulfide and dimethyl- β -propiothetin.

Noda, H.; Horiguche, Y.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 41 (4) 481-486 (1975) [19 ref. En] [Fac. of Fisheries, Mie Univ., Tsu, Mie, Japan]

Using 7 specimens of the dried laver from various culture grounds in Japan, 1 specimen from Korea, and 1 from indoor culture, the significance of dimethyl sulphide and its precursor, dimethyl- β -propiothetin, as flavour substances was examined. All these specimens were almost equal to each other in regard to colour and lustre, and showed no remarkable difference in proximate composition and contents of pigments and minerals. On the other hand, the concn. of dimethyl sulphide varied considerably, being 215 or 292 parts/billion in the samples from culture grounds in Japan, 168 parts/billion in a sample from Korea, and 88 parts/billion in that from indoor culture, reflecting the strength of odour in organoleptic examination. The concn. of dimethyl sulphide was closely related to that of dimethyl- β -propiothetin. AS

30

[Flavour volatiles of roasted fish meat.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 41 (1) 43-49 (1975) [1 ref. Ja, en] [Notre Dame Seishin Univ., Okayama, Japan]

The meat of 4 kinds of fish, (eel, conger eel, yellowtail and horse mackerel) was roasted with

seasoning composed of soy sauce and sugar, and the flavour volatiles formed were analysed by gas chromatography. The head space vapour (HSV) gas chromatograms obtained were similar to each other. Of the 5 peaks found in the HSV of eel meat roasted with seasoning the largest one was identified as ethanol and 3 small peaks as carbonyls. Only minor peaks were found in the HSV of eel meat roasted without seasoning. These results indicate that soy sauce and sugar are essential in formation of the aroma of roasted fish meat. AS

31

Isolation and identification of the volatile sulphides produced during chill-storage of North Sea cod (*Gadus morhua*).

Herbert, R. A.; Ellis, J. R.; Shewan, J. M.

Journal of the Science of Food and Agriculture 26 (8) 1187-1194 (1975) [19 ref. En] [Torry Res. Sta., 135 Abbey Road, Aberdeen AB9 8DG, UK]

The development of unpleasant off-odours and flavours during the chill-storage of trawl-caught cod has been well documented. Certain of these off-odours have been described as sulphidic. The data reported here suggest that H_2S , methyl mercaptan and dimethyl sulphide are responsible for the sulphidic off-odours associated with stale chill-stored cod. AS

32

Analysis of Buchu leaf oil.

Kaiser, R.; Lamparsky, D.; Schudel, P.

Journal of Agricultural and Food Chemistry 23 (5) 943-950 (1975) [23 ref. En] [Givaudan Res. Co. Ltd., CH-8600 Dubendorf, Switzerland]

In addition to the previously described stereoisomers of 8-mercapto-p-menthan-3-one about 120 further constituents have been identified in Buchu leaf oil of commercial origin. Some new sulphurated terpenoid ketones as well as p-menthan-3-one derivatives oxygenated in the 2 or 4 position found for the first time of occur in nature are discussed in detail. AS

33

Identification of components of the essential oil from the California pepper tree (*Schinus molle* L.).

Jennings, W. G.; Bernhard, R. A.

Chemie Mikrobiologie Technologie der Lebensmittel 4 (3) 95-96 (1975) [13 ref. En, de, fr] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California, USA]

Volatile components of the fruit of the California pepper tree were isolated by steam distillation, and separated using wall-coated open tubular glass capillary column gas chromatography. Individual components were characterized by MS, by comparison with known compounds, and by determination of retention indices. 18 compounds were identified. Fruit from this tree yields a volatile oil that has been used as a substitute for black pepper. AS

34

[Radio-gas chromatographic analysis of volatile aldehydes resulting from the oxidation of linoleic acid catalysed by soybean and oat lipoxygenases.] Radiogasechromatographische Analyse flüchtiger Aldehyde, die bei der mit Soja- und Hafer-Lipoxygenase katalysierten Linolsäure-Oxidation entstehen.

Heimann, W.; Franzen, K.-H.; Rapp, A.; Ullemeyer, H.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 159 (1) 1-5 (1975) [13 ref. De, en] [Inst. für Lebensmittelchemie, Univ., Karlsruhe, Federal Republic of Germany]

¹⁴C-labelled linoleic acid was incubated with an oat lipoxygenase preparation [see FSTA (1973) 5 5M596] or with a commercial soy lipoxygenase (Firma Roth, Karlsruhe, Federal Republic of Germany). The volatile aldehydes formed were separated by GLC and their radioactivity was determined. n-Hexanal was the main among 11 radioactive aldehydes formed with the soy lipoxygenase; and n-hexanal and nona-trans-2-enal were the only radioactive aldehydes formed with oat lipoxygenase. Formation pathways are discussed. SKK

35

Infrared identification of compounds separated by gas and thin layer chromatography: applications to flavor analysis. [Review]

Shankaranarayana, M. L.; Abraham, K. O.; Raghavan, B.; Natarajan, C. P.

CRC Critical Reviews in Food Science and Nutrition 6 (3) 271-315 (1975) [many ref. En] [Cent. Food Tech. Res. Inst., Mysore, India]

Aspects discussed include sample requirements, collection and transfer techniques, IR spectrometry of fractions, and the direct linking of gas chromatography and IR spectrometry. A brief survey of the applications of these techniques in flavour research is also given. Tables showing the compounds identified in foods by IR methods are given. JRR

36

Trace analysis of organic volatiles in water by gas chromatography-mass spectrometry with glass capillary columns.

Bertsch, W.; Anderson, E.; Holzer, G.

Journal of Chromatography 112, 701-718 (1975) [70 ref. En] [Dep. of Chem., Univ. of Alabama, University, Alabama 35486, USA]

Traces of volatile organic materials in water (including drinking water) were concentrated by gas phase stripping and adsorption onto a porous polymer, and the sample was transferred from adsorbant into a gas chromatographic column by a simple one-step procedure involving heat desorption. The drinking water samples examined (from Tuscaloosa and Houston, USA) contained a large number of chlorinated and brominated compounds which were not found in river water. AL

37

[Routine control of the volatile compounds of beer.] Zur Routine-Kontrolle flüchtiger Verbindungen des Bieres.

Steiner, K.; Länzlinger, U.

Schweizer Brauerei-Rundschaу 86 (4) 84-89 (1975) [33 ref. De] [Brauerei A. Hurlimann AG, Zürich, Switzerland]

Samples of standard pale beer and special pale beer from 5 Swiss breweries were examined in March and Sept. 1973 and Feb., July and Oct. 1974, the (i) volatile acids, (ii) phenols, (iii) higher alcohols, (iv) aldehydes, (v) esters, (vi) total N and (vii) amines being determined by routine methods in the steam distillate obtained using the 'Vapodest' apparatus (Firma Buchi, Flawil, Switzerland). (i)-(vii) mean values with ranges are tabulated for the 2 types of beer from each brewery. Overall mean ranges (25 samples) in standard beers were, respectively: (i) 2.0-5.6 ml 0.1N NaOH/250 ml beer, (ii) 0.12-0.26 extinction at 460 nm, (iii) 63-120 mg/l., (iv) 6-23 mg (as acetaldehyde)/l., (v) 10-37 mg (as ethylacetate)/l., (vi) 10-33.3 mg/l., and (vii) 0.36-0.90 mg (as dimethylamine)/l. Similar ranges were found in the special beers. These variations occurred through the original worts and degrees of attenuation were uniform. Amino N content of the beers ranged from 60 to 153 mg/l. for normal beers and from 74 to 163 mg/l. for special beers. SKK

38

[Use of aromatic alcohol for aromatization of wine.]

Lesnov, P. P.; Fertman, G. I.

Vinodelie i Vinogradarstvo SSSR No. 3, 28-29 (1975) [Ru] [Vinsovkhoz "Mashuk", USSR]

Vermouths are often aromatized with citrus fruit peel, which does however, contain objectionable terpene hydrocarbons. Aromatized ethanol was therefore prepared from orange peel to study the effect of the degree of crushing of the peel on the rate of migration of the terpene hydrocarbons into the individual fractions. Finely crushed peel (0.15-0.20 cm) proved better for rapid migration of the essential oils into the aqueous-ethanol solution, thereby permitting separation of the terpene hydrocarbons in the first fraction; the remaining fractions required no additional terpene removal. STI

39

Reverse osmosis recovery of flavor components from apple juice waters.

Matsuura, T.; Baxter, A. G.; Sourirajan, S.

Journal of Food Science 40 (5) 1039-1046 (1975) [19 ref. En] [Div. of Chem., Nat. Res. Council of Canada, Ottawa, Ontario K1A 0R9, Canada]

This paper illustrates the application of a fundamental physicochemical criteria approach for predicting quantitatively reverse osmosis separations of some typical apple flavour components in dilute aqueous solutions using aromatic polyamide membrane. It is shown both by analysis and by experiment that recovery of flavour

components present in apple juice waters is relatively much higher with an aromatic polyamide membrane than with a comparable cellulose acetate membrane. Reverse osmosis treatment of apple juice waters further shows that aroma recovery of flavour components increases with a decrease in operating temp. from 25°C to 7.5°C, an increase in operating pressure in the range 250-1000 lb/in² (gauge), and a decrease in the concn. of flavour components in the feed. IFT

40

[Analysis of nanotracers in coffee aroma by low temperature gas chromatography.]

Nanospurenanalytik an Kaffee Aroma durch Tieftemperatur - Gas - Chromatographie. In "Chimie des Cafes Verts, Torrefies et leur Derives" [see FSTA (1976) 8 3H386]. [Lecture] Kaiser, R. E.

pp. 73-80 (1974) [6 ref. De, fr, es, en] [Inst. für Chromatographie, D-6702 Bad Dürkheim, Federal Republic of Germany]

Various methods of analysis of coffee products have not yielded a satisfactory correlation with coffee aroma. It is suggested that low temp. gas chromatography used for environmental analyses (e.g. air and water) might be applied to coffee for detection of components present in nano quantities. Other studies have shown that some active substances have pronounced odour effects in concn. <10⁻¹⁰%. Methods of direct enrichment, multidimensional separation and specific detection could be applied to quality control of production and formulations of blends; some preliminary examples are given of possible apparatus and procedures. [See 8 3H386.] ELC

41

[Gas chromatographic analysis of headspace of defective beans.] In "Chimie des Cafes Verts, Torrefies et leur Derives" [see FSTA (1976) 8 3H386]. [Lecture]

Barel, M.; Challot, F.; Hahn, D.; Vicent, J. C. pp. 95-101 (1974) [5 ref. Fr, es, en, de] [IFCC, Lab. de Recherches de Nogent-sur-Marne, France]

Defective ('stinker') beans were warmed to 40°C for 45 min in a closed container and samples of the headspace gas were analysed by GLC.

Quantitative, but not qualitative, differences were observed between chromatogram patterns from healthy and 'stinker' beans. The increase in methanol and ethanol levels in the 'stinker' beans headspace suggests that their disagreeable odour results from a lactic acid type of fermentation occurring in the beans during storage. The nature of the odour could not be established. [See 8 3H386.] MEG

42

East African mild Arabica coffee quality characteristics associated with green bean coffee volatiles. I. Dimethyl sulphide. In "Chimie des Cafes Verts, Torrefies et leur Derives" [see FSTA (1976) 8 3H386]. [Lecture]

Gibson, A.

pp. 319-324 (1974) [17 ref. En, fr, es, de] [East African Ind. Res. Organisation, PO Box 20650, Nairobi, Kenya]

Samples of 2 hybrid spp. of East African mild Arabica coffee, N.39, which always produces a blueish colour, and KP.162, which lacks this desirable characteristic, were subjected to gas chromatographic head space analysis of the volatile green bean fraction. The major difference between them was the very much higher concn. of dimethyl sulphide in N.39 (1.65-8.20 vs. 1.20 µg-equiv./g toluene), the amount being influenced by different geographic, climatic even processing conditions. There appears to be a strong correlation between dimethyl sulphide concn. at the green bean stage, and the reported acidity of the roast coffee cup liquor. [See also following abstr.] [See 8 3H386.] AL

43

East African mild Arabica coffee quality characteristics associated with green bean coffee volatiles. II. Solai flavour. In "Chimie des Cafes Verts, Torrefies et leur Derives" [see FSTA (1976) 8 3H386]. [Lecture]

Gibson, A.

pp. 325-331 (1974) [En, fr, es, de] [East African Ind. Res. Organisation, PO Box 30650, Nairobi, Kenya]

Solai flavour is described as being slightly fruits in character or very slightly fermented in flavour. Coffee grown in the Solai region of Kenya has been shown by gas chromatography of head space volatiles to contain abnormally large amounts of ethanol and large amounts of higher alcohols. This high ethanol concn. was shown to be independent of processing method and to be an inherent characteristic of the growing coffee and governed partially by altitude. The method of head space analysis used has unfortunately been shown to be unsatisfactory, as grinding of green coffee causes the loss of a considerable number of volatiles originally present in the green bean tissue. However the primary observations are still valid. [See also preceding abstr.] [See 8 3H386.] AL

44

Geosmin: an important volatile constituent of beetroot (*Beta vulgaris*).

Murray, K. E.; Bannister, P. A.; Buttery, R. G. *Chemistry and Industry* No. 2, 973-974 (1975) [10 ref. En] [Food Res. Lab., CSIRO Div. of Food Res., PO Box 52, North Ryde, NSW 2113, Australia]

A powerful odorant with a strong earthy aroma has been found in beetroot. Its identification as geosmin is described. The contribution of geosmin to the aroma of raw beetroot is considered to be second only to that of the 3-alkyl-2-methoxypyrazines. Actinomycete microorganisms in soil are the most likely source of geosmin in beetroot. AL

45

Volatile components of roasted cocoa: basic fraction.

Vitzthum, O. G.; Werkhoff, P.; Hubert, P.
Journal of Food Science 40 (5) 911-916 (1975)
[51 ref. En] [Res. Dep., Hag AG Bremen,
Hagstrasse, 28 Bremen, Federal Republic of
Germany]

Roasted cocoa volatiles were isolated using the following technique: extraction with supercritical CO₂ under pressure followed by atmospheric steam distillation; adsorption on Porapak Q and subsequent extraction with purified diethylether; separation of the organic phase into basic and neutral fractions. Identification of basic cocoa aroma constituents was accomplished by MS in combination with a 200 m × 0.31 mm inner diam. glass capillary column. For the first time 59 compounds are reported in roasted cocoa including alkyl-, alkenyl-, acyl-, furyl- and alicyclic pyrazines, pyridines, quinoxalines, oxazoles, quinoline and methyl o-aminobenzoate. The CO₂-extraction process described is generally applicable to studies on volatile aroma constituents in food odour research. IFT

46

Formation of volatile compounds and brown products in the model system n-hexanal-glycine.

Davidek, J.; Jirousova, J.
Zeitschrift für Lebensmittel-Untersuchung und -Forschung 159 (3) 153-159 (1975) [14 ref. En, de] [Inst. of Chem. Tech., Prague, Czechoslovakia]

During the boiling of an aqueous mixture of n-hexanal and glycine (pH 9), both soluble and insoluble brown pigments and volatile compounds were formed. The following volatile compounds were identified by gas chromatography and MS: hexanone, decenone, undecenone, undecan-5-one, undecenedione, dodecenone, tridecanone, dodecanedione, tridecenone, dodecenedione, hexenyl hexanoate, and caproic, valeric and butyric acids. The brown pigments insoluble in water contained 0.57% N. The presence of conjugated double bonds, carbonyl and carboxyl groups was confirmed by spectral methods. The pigments were also separated by TLC on silica gel. AS

47

Mass spectral characterization of 2,4-dinitrophenylhydrazones of 24 saturated aldehydes and ketones found in foods.

Stanley, J. B.; Brown, D. F.; Senn, V. J.; Dollear, F. G.
Journal of Food Science 40 (6) 1134-1137 (1975)
[15 ref. En] [USDA, S. Regional Res. Cent., New Orleans, Louisiana 70179, USA]

The 2,4-dinitrophenylhydrazones (2,4-DNPH's) of 24 authentic saturated aldehydes and methyl ketones were prepared as reference standards for use in flavour and aroma studies. Normalized mass spectra of 2,4-DNPH's of 12 n-aldehydes within the range of 1-16 C atoms, 7 methyl ketones within the range of 3-11 C atoms, 4 representative branched chain aldehydes and 1 branched chain ketone were

recorded and are reproduced. The 2,4-DNPH's of n-aldehydes of 1-4 C are characterized by a major peak at mass 180, while those with ≥5 C have characteristic peaks at 206 and 224. Linear methyl ketones of 3-5 C have a prominent peak at mass 181 and methyl ketones with ≥6 C atoms exhibit diagnostic peaks at 178 and 238. The mass spectra of 2,4-DNPH's of branched chain aldehydes and ketones are characterized by major peaks directly related to the pattern of branching. IFT

48

The use of activated charcoal for the concentration and analysis of headspace vapours containing food aroma volatiles.

Clark, R. G.; Cronin, D. A.
Journal of the Science of Food and Agriculture 26 (11) 1615-1624 (1975) [26 ref. En] [Procter Dep. of Food & Leather Sci., Univ. of Leeds, Leeds, UK]

The possibility of using very small quantities of activated charcoal for concentrating aroma volatiles from the headspace vapour over foodstuffs was investigated. Excellent recoveries of a range of organic compounds trapped on 2 mg of charcoal in a glass capillary tube were obtained when the components were desorbed rapidly at 260°C on to a gas chromatographic column, using a specially constructed injection device. In addition, the charcoal traps were found to be highly effective for concentrating volatiles at ambient temp. from very large (18 l.) vol. of headspace vapour over raw walnuts, a foodstuff having a weak but characteristic aroma. Moreover, the aroma of the head-desorbed volatiles was judged by sensory evaluation to closely resemble that of fresh walnuts. The results suggest a considerable potential for charcoal in the headspace analysis of foodstuffs and of other substrates. AS

49

[Gas chromatographic studies on alcoholic beverages. VII. Determination and evaluation of ethyl acetate, methyl acetate, acetal, ethyl propionate, n-propyl acetate and 2-butanol.] Über gaschromatographische Untersuchungen in alkoholischen Erzeugnissen. VII. Zur Bestimmung und Bewertung von Äthylacetat, Methylacetat, Acetaldehyddiäthylacetal (Diäthylacetal), Äthylpropionat, n-Propylacetat und Butanol-(2). Reinhard, C.

Mitteilungen: Rebe, Wein, Obstbau und Früchteverwertung 25 (3) 205-208 (1975) [12 ref. De, en, fr] [Landesuntersuchungsamt für das Gesundheitswesen Nordbayern, Fachbereich Chemie, Aussenstelle Würzburg, Federal Republic of Germany]

Comments, including brief notes on new results concerning some volatile components of wine products (distillates, brandies) are presented on papers abstracted in FSTA (1974) 6 10H1760 & (1975) 7 10H1563 & 1564. [See FSTA (1975) 7 7H1013 for part VI.] SKK

50

[Effect of different production methods on the aroma complex of natural Muscat sparkling wines.]

Einfluss verschiedener Produktionsverfahren auf den Aromakomplex natürlicher Muskatschaumweine.

Zakow[Zakov], D.; Goranow[Goranov], N.; Spirow[Spirov], N.

Mitteilungen: Rebe, Wein, Obstbau und

Früchteverwertung 25 (4) 293-300 (1975) [10 ref. De, en, fr] [Inst. für die Weinind., Sofia, Bulgaria]

Sparkling wines were made from 1973 harvest Vrachanski Misket grapes by (i) in-bottle fermentation, (ii) the modified Asti spumante method (fermentation to 70-75 g/l. sugar content, bottling, further fermentation to remove 20-23 g sugar/l., cooling to -4°C, turning and jolting at 0°C), or (iii) by an intermediate method (fermentation to 20-22 g sugar/l., bottling, turning and jolting as for (i)). Tabulated values for composition of (i)-(iii) wines include: alcohol content, 12.36, 9.5 and 10.6 vol.%; sugar, 48.0, 41.2, and 63.7 [?] g/l.; volatile acids, 0.36, 0.42 and 0.33 g/l.; total N, 235, 302 and 280 mg/l.; free SO₂, 4.5, 7.0 and 5.1 mg/l.; and organoleptic score, 7.7, 7.9 and 8.1. Aroma substances were measured by GLC, chromatograms being presented. Total quantities in (ii) and (iii) were 78 and 60%, respectively, of those in (i). SKK

51

[Determination of the hop oil content in hops and hop preparations.] Die Bestimmung des Hopfenölgehaltes in Hopfen und Hopfenpräparaten.

Krüger, E.; Baron, G.

Monatsschrift für Brauerei 28 (5) 118-120 (1975)

[5 ref. De, en, fr] [Forschungsinst. für chem.-tech. Analyse, Versuchs- und Lehranstalt für Brauerei, Berlin (West)]

A new device for detn. of the essential oil content of hops and hop products is described. The essential oil is separated by steam distillation, condensed, and dissolved in an organic solvent (petroleum ether); the condensed water flows back to the steam distillation unit. The solvent is then separated from the hop essential oil by vacuum evaporation. Replicate studies on hop powder samples showed reproducibility to be excellent. TUB-IGB

52

Peach dynamic adaptations.

Broderick, J. J.

International Flavours and Food Additives 6 (4) 243, 247 (1975) [16 ref. En] [H. Kohnstamm & Co. Inc., New York, USA]

Tabulated data show: components identified in peaches prior to 1952 (8); components used by flavourists not identified in peach (6); and components identified in peach to date (17 alcohols, 8 acids, 16 carbonyls, 31 esters 4 hydrocarbons etc.). Peach formulations listed are:

the de Vries formulation (a base for peach flavours with high temp. stability); Merory formulation (the usual commercial type) for Imitation Neroli MF 112 and Imitation Peach MF 115; and a modified artificial Peach Flavour. VJG

53

Formation of aldehydes and alcohols in tomato fruit from ¹⁴C-linolenic and linoleic acids.

Stone, E. J.; Kazeniac, S. J.

Abstracts of Papers, American Chemical Society 169, AGFD 30 (1975) [En] [Campbell Inst. for Food Res., Campbell Place, Camden, New Jersey 08101, USA]

The main volatile compound formed by the enzymic degradation of ¹⁴C-linolenic acid in blended tomatoes was cis-3-hexenal (81%), which was partly converted to trans-2-hexenal (83%) by chemical isomerization during recovery of the volatiles. Small amounts of cis-3-hexenol (5%), n-hexenal (2%) and n-hexanol (1%) were also produced under the same conditions. With crushed tomatoes, 61% cis-3-hexenol was recovered with fairly large amounts of cis-3-hexenal (10%) and trans-2-hexenal (24%). Small amounts of n-hexenal (1%) and n-hexanol (2%) were also developed. ¹⁴C-linoleic acid with blended tomatoes produced 63% n-hexenal and 37% n-hexanol. With crushed tomatoes, 90% n-hexanol and only 10% n-hexenal were formed from ¹⁴C-linoleic acid. Interconversions of the C₆ aldehydes and C₆ alcohols are described. Relations between some terpene and aromatic aldehydes and alcohols in tomatoes as well as 3-methylthiopropenal/w-methylthiopropanol are also discussed. AS

54

Relative flavor contribution of individual volatile components of the oil of onion (*Allium cepa*).

Galetto, W. G.; Bednarczyk, A. A.

Journal of Food Science 40 (6) 1165-1167 (1975) [11 ref. En] [Res. & Development Lab., McCormick & Co., Hunt Valley, Maryland, 21031, USA]

Stepwise multiple regression analysis techniques were applied to onion oil in order to correlate quantitative gas chromatographic data with taste panel evaluations. The results of 47 analyses show a high coeff. of determination (R² = 0.870) between overall onion flavour and the presence of methyl propyl disulphide, methyl propyl propyl trisulphide and dipropyl trisulphide. In addition 3 as yet unidentified, minor components make lesser but significant flavour contributions. Dipropyl disulphide, the major component of onion oil, apparently adds little, if any, to the overall flavour when in the presence of the above-mentioned polysulphides. IFT

55

A rapid spectrophotometric method of determination of thiopropanal S-oxide (lachrymator) in onion (*Allium cepa* L.) and its significance in flavour studies.

Freeman, G. G.; Whenham, R. J.

Journal of the Science of Food and Agriculture 26 (10) 1529-1543 (1975) [21 ref. En] [Biochem. Section, Nat. Vegetable Res. Sta., Wellesbourne, Warwick, UK]

The method depends upon rapid extraction of the lachrymator (thiopropanal S-oxide) into hexane at 0°C and observation of the absorbance max. at 254 nm as compared with that of the synthetic compound as a standard. Thiopropanal S-oxide was synthesized by dehydrochlorination of 1-propanesulphiny chloride. Evidence that the observed absorbance was due to the presence of thiopropanal S-oxide was based mainly on agreement of the properties of the synthetic compound with those of hexane extracts of fresh onion juice with respect to max. absorption wavelength values, reaction with L-cysteine reagent, and TLC. Further confirmation was afforded by the properties of alliinase fission products of synthetic (\pm)-S-1-propenyl-L-cysteine sulphoxide. A series of applications of the method in determination of onion flavour intensity, including non-destructive sampling, is described.

AS

56

Volatile flavour components of watercress.

MacLeod, A. J.; Islam, R.

Journal of the Science of Food and Agriculture 26 (10) 1545-1550 (1975) [19 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Campden Hill Road, London W8 7AH, UK]

Using previously reported methods of sample preparation [see e.g. FSTA (1975) 7 10Q152] an essence of watercress was obtained which proved to contain only 4 major components. All are glucosinolate degradation products with 3-phenylpropionitrile the major compound, although the related 2-phenylethyl isothiocyanate is most important in flavour terms. The other compounds obtained are long chain ω -methylthioalkyl nitriles.

AS

57

[Flavouring of roasted laver. I.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 41 (2) 193-199 (1975) [6 ref. Ja, en] [Notre Dame Seishin Univ., Okayama, Japan]

The flavour volatiles of roasted laver, a characteristic Japanese food, were studied by gas chromatography. Approx. 40 peaks were found from heat-space volatiles of freshly roasted laver, which were much reduced when the laver was allowed to stand for 2 min at room temp. Further volatiles released from laver by hot water again showed approx. 40 peaks but the relative intensities

were altered compared to the 'freshly roasted' volatiles. Carbonyls, bases and sulphur-containing substances seemed to be important volatiles of roasted laver. Of the 14 carbonyl compounds detected, 7 have been identified as acetaldehyde, propionaldehyde, iso-butyraldehyde, acetone, n-butyraldehyde, iso-valeraldehyde, and caproaldehyde. [From En summ.] JRR

58

Analytical evaluation of seasoning extracts (oleoresins) and essential oils from seasonings. II.

Salzer, U.-J.

International Flavours and Food Additives 6 (4) 206-210 (1975) [27 ref. En] [Haarmann & Reimer GmbH, D-345 Holzminden, Federal Republic of Germany]

Consideration is given to additional groups of spices [see FSTA (1975) 7 10T515 for part I]; spice extracts for which the analytical criteria are essential oil and/or pungent substances (capsicum, ginger and pepper); and spices extracts for which the analytical criteria are essential oil and/or colouring matter (turmeric and paprika). Determinants of quality are: capsicum extract - capsaicin content, determined by paper chromatography and partition GC; ginger extract - essential oil content, with GC determination of citral, zingiberene, B-sesquiphellandrene and ar-curcumen, methoxy content for calculation of pungent principles, and water content by Karl Fischer reagent; pepper extract - essential oil content, terpene and sesquiterpene hydrocarbon content, and piperinoids; turmeric extract - colouring matter content by measuring the extinction at 420 - 425 nm, and content of essential oil; and paprika oleoresin - colouring matter content using either the EDA Standard No. 239 or ASTA method MSD-10. VJG

59

Occurrence of volatile nitrosamines in spice premixes.

Gough, T. A.; Goodhead, K.

Journal of the Science of Food and Agriculture 26 (10) 1473-1478 (1975) [25 ref. En] [Lab. of the Gov. Chem., Stamford Street, London SE1 9NQ, UK]

Nitrosamines have been found in spice-curing salt premixes used in meat products. A number of premixes were analysed using gas chromatography and high resolution MS and the presence of N-nitrosopiperidine was confirmed in the majority of the premixes. After storage for 6 months, levels of N-nitrosopiperidine had increased in most instances, and N-nitrosopyrrolidine was detected in several samples. AS

60

A FORTRAN programme to aid in the detection of flavour changes.

Blakesley, C. N.

Lebensmittel-Wissenschaft + Technologie 8 (6) 265-266 (1975) [En] [Nat. Food Res. Inst., Council for Sci. & Ind. Res., PO Box 395, Pretoria, South Africa]

A computer programme in FORTRAN has been prepared to aid in locating those areas of total ion GLC-MS chromatograms where differences occur in the GLC patterns. This method is very suitable for detecting chemical differences between the flavour of one food sample and that of another.

AS

61

[Reproducibility of determinations of volatile constituents in beer by the head-space method using gas chromatography.]

Schleiffer, E.; Deluzarche, A.; Tanielian, C.

Bios 6 (7/8) 270-271 (1975) [6 ref. Fr] [Lab. Associeau CNRS No. 81, Univ. Louis-Pasteur, Strasbourg, France]

Recommended procedures for head space analysis of beer by GLC analysis using (i) flame ionization or (ii) electron capture methods are outlined briefly. Results of analyses of 30 samples using method (i) gave the following standard errors: acetaldehyde 7%, methyl acetate 6.7%, ethyl acetate 8.4%, n-propanol 7.3%, isobutanol 5.5%, isoamyl acetate 11.1% and 2-methyl-1-butanol 3%; 30 samples analysed by method (ii) had standard errors of 3% for diacetyl and 4% for pentanedione. MEG

62

[Volatile compounds in fresh and processed bananas.]

Uzelac, M.; Martin, Z. de; Silva, E.; Kato, K.; Vitali, A.

Coletanea do Instituto de Tecnologia de Alimentos 6 (1) 233-256 (1975) [22 ref. Pt, en]

Flavour differences between fresh and processed bananas were examined by GLC of volatile components obtained from fresh bananas by extraction, vacuum distillation and low temp. concn. (-20 to -195°C) and from banana puree by head space analysis. A series of chromatograms show that differences in flavour are attributable to changes in relative proportions of aroma components, rather than to formation of other compounds. Processed and spoiled bananas showed a loss of high mol. wt. and increase in low mol. wt. components which could be responsible for flavour changes. The loss of volatiles during processing was attributed to deaeration and sterilization. The usefulness of head space analysis for quality control of raw material or process control was confirmed.

RM

63

Volatile constituents of tamarind (*Tamarindus indica* L.).

Lee, P. L.; Swords, G.; Hunter, G. L. K.

Journal of Agricultural and Food Chemistry 23 (6) 1195-1199 (1975) [26 ref. En] [Corporate Res. & Development Dep., Coca-Cola Co., Atlanta, Georgia 30301, USA]

The volatile constituents of tamarind were investigated by the combined technique of GLC-MS with 61 major components identified and confirmed. 5 additional compounds identified as artifacts appeared to originate from the vacuum steam distillation apparatus during isolation of the volatiles. Several pyrazines and thiazoles, normally formed during roasting of a variety of foods, were found in tamarind. The results of this study suggest that the overall aroma of tamarind consists of citrus notes and warm spice-like flavours with some roasted character. AS

64

Analysis of concentrated orange essence and comparison with known essence composition.

Shaw, P. E.; Moshonas, M. G.

Proceedings of the Florida State Horticultural Society 87, 305-310 (1974) [18 ref. En] [USDA Citrus and Subtropical Products Lab., Winter Haven, Florida, USA]

Commercially produced conc. orange essence was quantitatively and qualitatively analysed by GLC. The 6 main components were quantitatively analysed by a rapid GLC procedure that permits monitoring of the most volatile components most easily lost during concn. By qualitative analysis, 30 components were identified. A list of all 130 known essence components was compiled for comparison with conc. essence composition. The major and most of the minor components isolated from conc. essence had been previously isolated. 2 minor components, propionaldehyde and 3-ethoxyhexanal, not previously found in citrus essences were identified in this study. AS

65

[Localization of aroma in the grape berry: var. Muscat d'Alexandrie and Cabernet-Sauvignon.]

Bayonove, C.; Cordonnier, R.; Ratier, R.

Comptes Rendus des Seances de l'Academie d'Agriculture de France 60 (18) 1321-1328 (1974) [9 ref. Fr] [Sta. de Tech. Vegetable, INRA, CRA Montpellier, France]

The distribution of aroma components was studied in the berries of 2 var. of grapes. Tabulated results showed that var. Muscat d'Alexandrie and Cabernet-Sauvignon contained 57 and 50% of volatiles in the peel, 14 and 10% in the pulp and 29 and 40% in the juice. The distribution of terpene alcohols in peel, pulp and juice of Muscat d'Alexandrie was: linalool, 26, 24 and 50%; nerol, 95.6, 2.7 and 1.7%; geraniol, 94.2, 3.3 and 2.5%. The peel of Cabernet-Sauvignon contained the major part of the unidentified heavy fractions. RM

66

Comparison of flavor components in fermented and nonfermented bread.

Chung, K. H.

Dissertation Abstracts International, B 36 (5) 2142: Order No. 75-25025 (1975) [En] [Kansas State Univ., Manhattan, Kansas 66502, USA]

2 groups of volatile components (fatty acids and carbonyl compounds) were separately isolated from fermented and nonfermented breads. 7 free fatty acids were identified in doughs and bread produced by different processes; sponge-dough bread contained 2 additional components. Carbonyl compounds were converted to 2,4-dinitrophenylhydrazones and fractionated. Average total carbonyl content and carbonyl content of the dicarbonyl, ketoglyceride and monocarbonyl fractions were measured and compared for the different breads. The monocarbonyl fraction was further separated to determine the distribution of monocarbonyls involved in bread flavour. Chemical analyses of bread flavour components were supported by organoleptic tests. Consumer preference tests of (i) Flavol, (ii) sponge-dough and (iii) no-time breads showed that (i) was not significantly different from (ii) and (iii) in sweetness, sourness or overall flavour. The aroma of (i) was, however, significantly better ($P < 0.05$) than that of (iii). JA

67

[On the nature and composition of products removed during deodorization. III. Kinetic study of removing volatile and water-soluble compounds.]

Sambuc, E.; Reymond, G.; Naudet, M.

Revue Francaise des Corps Gras 22 (3) 137-145 (1975) [6 ref. Fr, de, en, es] [Lab. Nat. des Matieres Grasses, ITERG, Univ. de Provence, 13331 Marseille Cedex, 3, France]

To study the kinetics of removal, volatile and water-soluble components of deodorization were caught quantitatively in a series of gas- and water-tight traps at progressively lower temp. where one gaseous and 2 liquid phases coexist (a major aqueous phase and a very minor organic phase). Introduction of a water-soluble organic solvent (methanol) reduced the mixture to a gas and a liquid phase suitable for GLC analysis (stainless steel column with Porapak Q 80/100, separation efficiency at 100°C for toluene/butyl acetate = 1.45, linear temp. programming 2°C/min at 60-220°C, carrier gas 40 ml/min) with multiple internal standards (toluene, butyl acetate, octane). Data are given on quantitative interpretation of chromatograms, reproducibility of analyses and of deodorization, major volatile components and kinetics of their removal under various operating conditions (175 and 225°C, 2.5 and 5 torr, 1.5 and 2.5% steam injection/h). Major differences are due to variations in temp. The method of calculating the total concn. of a constituent is shown in an appendix. [See *Revue Francaise des Corps Gras* (1970) 17 (8/9) 529 for part II.] RM

68

Identification and evaluation of the flavor-significant components of ginger essential oil.

Bednarczyk, A. A.; Kramer, A.

Chemical Senses and Flavor 1 (4) 377-386 (1975) [20 ref. En] [McCormick & Co. Inc., 204 Wight Avenue, Hunt Valley, Maryland 21031, USA]

The flavourfully significant compounds in ginger essential oil were selected statistically by use of a stepwise multiple regression analysis which treated individual peak quantities on a gas chromatogram as independent variables and taste panel scores for ginger flavour intensity as dependent variables. Statistical analysis showed that 4 gas chromatographic peaks, consisting of α -terpineol, citral a, citral b (peak 11), β -sesquiphellandrene, ar-curcumen (peak 14), nerolidol (peak 19), and a sesquiterpene alcohol (peak 29), accounted for 85% of the panel's flavour response ($R^2 = 0.85$). Taste panel evaluations of the isolated components indicated that β -sesquiphellandrene and ar-curcumen are the prime contributors to the characteristic 'ginger' attribute. α -Terpineol, citral a and citral b contribute to the 'lemony' attribute of ginger oil and may therefore be desirable additives to whole ginger oil to intensify its 'lemony' character. Nerolidol contributes to the 'woody' or 'soapy' attribute and does not appear to be a good potential additive to ginger oil. A trained sensory panel judged a mixture of α -terpineol, citral a, citral b, β -sesquiphellandrene, ar-curcumen and nerolidol to be characteristic of ginger oil. The panel found a mixture of these chemicals, in combination with ginger heat chemicals, to be a suitable imitation ginger flavour. [Continued in following abstr.] AS

69

Identification and evaluation of the flavor-significant components of ginger essential oil.

Bednarczyk, A. A.; Kramer, A.

Chemical Senses and Flavor 1 (4) 377-386 (1975) [20 ref. En] [McCormick & Co. Inc., 204 Wight Avenue, Hunt Valley, Maryland 21031, USA]

[Continued from preceding abstr.] The study has shown that statistics can be used in selecting the individual flavour contributing components of a flavour essence. This approach can greatly reduce the number of compounds which need be identified in the investigation of the composition of natural flavouring substances. AS

70

A new sesquiterpene alcohol of the copane series from angelica root oil.

Taskinen, J.

Acta Chemica Scandinavica, B 29 (10) 999-1001 (1975) [12 ref. En] [Res. Lab. of the State Alcohol Monopoly (Alko), Box 350, SF-00101 Helsinki 10, Finland]

A new sesquiterpene alcohol was isolated from the volatile root oil of *Angelica archangelica* L. On the basis of spectral and chemical evidence structure 8, cis- α -copaene-8-ol, was assigned to this compound. [See also *FSTA* (1976) 8 3T83.] AS

71

Co-distillation method for recovering volatile flavour compounds from citrus essential oils.

Shaw, P. E.; Coleman, R. L. (United States of America, Secretary of Agriculture)

United States Patent 3 917 865 (1975) [En]

Volatile flavour compounds are recovered from citrus essential oils by distillation in the presence of a solvent, e.g. acetone, methanol or a non-toxic fluorinated hydrocarbon, at approx. 2.7-3.3 mm Hg and 26-33°C to recover approx. 2.2% by wt. of the solution. The conc. flavour fraction is anhydrous and water soluble and is used to impart a fresh flavouring to citrus juices and other beverages without increasing the oil or water content of the products. GL

72

The application of chromatographic data to commodity source identification.

Davies, A. M. C.

Journal of Chromatography 115 (2) 293-298

(1975) [10 ref. En] [Res. Dep., Reckitt & Colman Food Div., Carrow, Norwich NR1 2DD, UK]

An empirical method of assigning samples to determined groups of any particular commodity, within the population of that commodity, is described. Using previously published chromatographic data, the method correctly identified 10 out of 11 samples of spearmint oil (*Mentha spicata* or *M. cardiaca*), and using fatty acid analysis data for different cuts of beef, pork and lamb satisfactorily identified animal fat types, but did not distinguish satisfactorily between cuts of beef, pork and lamb. AL

73

[Process and apparatus for the extraction of volatile substances.]

Weber, G. (Societe des Produits Nestle SA)

Swiss Patent 563 792 (1975) [Fr]

Extraction of volatile substances from particulate material, e.g. coffee and tea, using simplified apparatus, consists of allowing the material to fall under gravity and meet a gaseous flow, preferably water vapour, which is flowing up and which carries the volatile substances with it. The pressure depends on the nature of the gaseous fluid and the temp. at which the process is being carried out. W&Co

74

[Use of aromas in the food industry.]

Dubois, P.; Adda, J.

RTIA [Revue Technique et Economique de l'Industrie Alimentaire] 23 (232) 21, 23, 25, 27-28, 31 (1975) [1 ref. Fr] [Cent. de Tech. des Produits Vegetaux, Dijon, France]

The chapter on aroma compounds from the INRA leaflet (l'INRA an Service des Industries Agricoles et Alimentaires) is reproduced. Information is provided on the general nature of

aroma compounds and on analytical results obtained for the 'cooked' flavour of apple and grape juices, fat oxidation products in bread and peas, volatile aroma components of wines and spirits, aroma compounds of cheese, and decomposition products. Some data are shown as chromatograms (peas, wine, cheese) or tables (volatile phenols from wines, neutral volatile compounds from 5 types of cheese). RM

75

[Gas chromatographic determination of higher alcohols and esters in beer distillates extracted with carbon disulphide.] Gaschromatographische Bestimmung höherer Alkohole und Ester aus mit Schwefelkohlenstoff extrahierten Bierdestillaten. Gruss, R.; Kleber, K.; Zürcher, C.

Monatsschrift für Brauerei 28 (12) 293-299

(1975) [25 ref. De, en, fr] [Darmstädter Landstrasse 185, D-6000 Frankfurt am Main 70, Federal Republic of Germany]

The method of Koch et al. [see FSTA (1972) 4 5H779] for detn. of higher alcohols and esters in wines and spirits was modified for analysis of beer. The method is based on distillation of the beer sample (after standardization of the ethanol content to 10%), extraction of higher alcohols and esters from the distillate with a small quantity of CS₂, and GLC analysis of the CS₂ extract. This method permits detn. of higher alcohols, ethyl esters of fatty acids, acetates and fatty acids in beer. Results agreed well with results of head-space GLC analyses or direct injection of beer samples into the gas chromatograph. Reproducibility was better than that of the headspace GLC method. TUB-IGB

76

[Changes in the aroma components of apples during the production of concentrated fruit juices.]

Örsi, F.; Erdős, Z.

Élelmezési Ipar 29 (2) 45-50 (1975) [6 ref. Hu, ru, de, en] [Budapest Müszaki Egyetem, Budapest, Hungary]

The juice of apples of Jonathan, Golden Delicious and Easter Rosemary var. grown in Hungary was extracted by pressure, the juice was evaporated to 68-70% (refractometer), and the components in the ether extract of the juice were diluted to 10%. 30 aroma components were identified on PEG and UCON columns; the relative retention times and chromatograms are given. The peaks observed on the chromatograms proved to be characteristic of the individual apple var. The aroma profile was shown to undergo fundamental changes on microbial decomposition. During the concn. of the fresh juice, the amount of components of low bp (responsible for the fresh character of apple juice) decreased significantly. IF

77

Volatile constituents of grape leaves. I. *Vitis vinifera* variety Chenin blanc.

Wildenrad, H. L.; Christensen, E. N.; Stackler, B.; Caputi, A., Jr.; Slinkard, K.; Scutt, K.

American Journal of Enology and Viticulture 26 (3) 148-153 (1975) [16 ref. En] [E. & J. Gallo Winery, Modesto, California 95353, USA]

'Chenin blanc' grape leaf volatile compounds were isolated by steam distillation. The distillate collected was extracted with pentane, and the compounds present were identified by gas chromatography/MS. Prominent in grape leaves are the 6-C compounds, and the terpenes and their derivatives; S-containing compounds were also identified. Sensory evaluation of compounds issuing from gas chromatographic columns indicated that the 6-C compounds were largely responsible for the "grassy" flavour from the leaves. To confirm this flavour, trans-2-hexenal, trans-2-hexenol, cis-3-hexenal, and α -hexenol in wine were evaluated by a taste panel. At ≤ 10 ppm the compounds were detected at the 1% level of significance. To indicate whether 6-C and other compounds might be released by macerated leaves in winemaking, wines were produced from grape juices containing 2% w/v leaves of which 0, 5, 15, and 25% w/w had been macerated. Taste-panel sensory evaluation of the wines indicated that $\geq 5\%$ leaf maceration yielded wines of significantly lower quality. JRR

78

Use of polyols as stationary phases for the gas chromatographic separation of volatile compounds from excess amounts of ethanol.

Verachttert, H.; Oevelen, D. van; Bevers, J.

Journal of Chromatography 117 (2) 295-304 (1976) [10 ref. En] [Lab. of Ind. Microbiol. & Biochem., Univ. of Leuven, Kardinaal Mercierlaan 92, Heverlee-Louvain 3030, Belgium]

Erythritol, ribitol, arabitol, xylitol, mannitol, dulcitol and sorbitol were studied as stationary phases for the separation of volatile compounds (volatiles) normally present in alcoholic beverages. Excellent separations of most of the volatiles from each other, and especially from the excess amounts of ethanol that are generally present, were obtained with 2- and 5-m glass columns filled with Chromosorb P coated with a polyol. A method is presented that permits analysis of beer volatiles, from acetaldehyde up to phenethyl alcohol, in about 90 min. This method includes direct injection of beer samples into the columns. After several months no perceptible changes in column performance were observed, indicating that a rapid and cheap method for analysis of beer volatiles is now available. Wines and spirits have been analysed by the same method. AS

79

Application of gas-liquid chromatography to analytical problems in brewing chemistry. [Lecture]

Rehberger, A. J.; Benard, M.; Chau, S.; Garza, A.; Kincaid, C.; Jamieson, A.; Lindsay, R.; Meilgaard, M.; Nickerson, G.; Schait, A.; Williams, R.;

Bradlee, L.

Proceedings. American Society of Brewing Chemists pp. 154-162 (1972, publ. 1973) [3 ref. En]

A progress report is presented on the work of a Sub-Committee which is developing the use of GLC for detn. of volatile compounds in beer. Following results of earlier experiments, the present programme (10 collaborators) was designed to compare (i) headspace and (ii) direct injection methods, and (iii) glycerol-trihydroxyhexane, and (iv) Carbowax 20M columns, for detn. of n -propyl alcohol, isobutyl alcohol, n -amyl alcohol, isoamyl alcohol, ethyl acetate and isoamyl acetate. Each laboratory examined 8 commercial beer samples. Detailed results are tabulated for each laboratory for the combinations (i) and (iii), (i) and (iv), (ii) and (iii) and (ii) and (iv), with means and SD.

General agreement was good between laboratories and between methods for individual compounds. Most difficulty was experienced with ethyl acetate and isoamyl acetate, for which (iv) was inferior to (iii). Work is to continue on comparison between (i) and (ii) using (iii) only, and examination of some modified procedures suggested by individual analysts. Detailed practical instructions relating to (i), (ii), (iii) and (iv) procedures are given in appendices. [See FSTA (1976) 8 6H982.] ELC

80

Comparison of gas chromatographic methods for analysis of beer flavors. [Lecture]

Lindsay, R. C.; Withycombe, D. A.; Micketts, R. J.

Proceedings. American Society of Brewing Chemists pp. 4-7 (1972, publ. 1973) [17 ref. En] [Dep. of Food Sci., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Methods for direct injection, headspace analysis, carbon disulphide extraction, extraction of freeze-dried solids, and porous polymer entrainment were evaluated for applications in beer flavour analysis. A combined carbon disulphide extract-porous polymer entrainment procedure using high-efficiency large-bore capillary columns was developed, and should find many applications in beer flavour research. [See FSTA (1976) 8 6H982.] AS

81

A survey of volatile components of some *Allium* species in terms of S-alk(en)yl-L-cysteine sulfoxides present as flavour precursors.

Freeman, G. G.; Whenham, R. J.

Journal of the Science of Food and Agriculture 26 (12) 1869-1886 (1975) [35 ref. En] [Biochem. Section, Nat. Vegetable Res. Sta., Wellesbourne, Warwick, UK]

The volatile flavour components of 27 *Allium* spp. and cultivars, mostly edible but including some decorative species for comparison, were investigated by a series of GLC, TLC and UV spectrophotometric methods. By means of simulation experiments with synthetic precursors and intermediates, the data were interpreted in terms of the amino acid precursors present in the intact tissues and the species classified as containing

(i) S-1-propenyl-, (ii) S-2-propenyl- and (iii) S-methyl-L-cysteine sulfoxides as their principal flavour precursors. Characteristic examples of the 3 types are *A. cepa* L. (onion), *A. sativum* L. (garlic) and *A. afflatunense* B. Fedtschenko, respectively. An object of the work was to demonstrate broad chemical similarities between species as well as their differences, which are emphasized in keys for classification on the basis of morphological characters. In addition to onion, leek, shallot, garlic and chives, species such as *A. chinense*, *A. fistulosum* and *A. tuberosum* have widespread use as food, particularly in the Far East. The literature on this aspect is briefly summarized. AS

82

[Gas chromatographic investigation of the steam-distillable aroma substances of tomato products.] Petro, O.; Szarföldi, J.

Elemszervizsgálati Közlemények 21 (1/2) 29-38 (1975) [27 ref. Hu, ru, de, en, fr] [Központi Elemszeripari Kutató Intézet, Budapest, Hungary]

Aroma components of raw tomatoes, tomato puree and powdered tomatoes were separated at various temp. under isotherm conditions on a stationary phase of Carbowax 20 M on Chromosorb P as carrier. 61 peaks were detected in raw tomatoes, 65 in tomato puree and 59 in powdered tomatoes. Comparison of aromagrams showed that with heat treatment, the number and quantity of volatile components decreased, and those of components of higher bp increased. Components were identified by the retention indices of Kovats [*Helvetica Chimica Acta* (1963) 46, 2705] which were compared with those of model substances. Also an enrichment technique and data from the TLC investigation of carbonyl compounds were used in the identification procedure. IF

83

[Gas chromatographic - mass spectrometric differentiation of aroma compounds from strawberry varieties. II. *Fragaria nilgerrensis*.]

Gaschromatographisch-massenspektrometrische Differenzierung der Aromastoffe von Erdbeerarten. II. *Fragaria nilgerrensis*.

Staudt, G.; Drawert, F.; Tressl, R.

Zeitschrift für Pflanzenzüchtung 75 (1) 36-42 (1975) [7 ref. De, en] [Bundesforschungsanstalt für Rebenzüchtung, Siebeldingen, Federal Republic of Germany]

Fragaria nilgerrensis 62, 14-5 from Likang, China was grown in the Siebeldingen Institute. 300 g ripe fruit were homogenized with 500 ml methanol, 250 ml 0.1M phosphate buffer were added, and 900 ml pressed juice with 1 µl β-phenylethyl butyrate as internal standard were extracted for 8 h in an extraction apparatus with 40 ml n-pentane/methylene chloride (2:1). The extract was concentrated to 0.25 ml using a Vigreux column for examination by GLC and mass spectrometry as described by Drawert et al. [*Zeitschrift für Naturforschung, C* (1973) 28, 488].

A total of 120 aroma components, many of them unidentified, were detected. Only 11 of them corresponded to main aroma components of *F. vesca*, *F. moschata*, *F. chiloensis* and *F. virginiana* (tabulated). No methylketones or their corresponding alcohols were detected. n-octyl acetate, n-decyl acetate, methyl capronate, ethyl caprylate and ethyl caprinate were present. Esters of higher alcohols with C4-C10 carboxylic acids were absent. Aromatic compounds present included methyl benzoate, benzyl acetate, and methyl or ethyl cinnamate. γ-dodecalacetone was the most prominent aroma compound. [See also FSTA (1970) 2 2J115.] SKK

84

Formation of volatile esters in strawberries.

Yamashita, I.; Nemoto, Y.; Yoshikawa, S.

Agricultural and Biological Chemistry 39 (12) 2303-2307 (1975) [18 ref. En] [Nat. Food Res. Inst., Min. of Agric. & Forestry, Shiohama 1-4-12, Koto-ku, Tokyo, Japan]

Aliphatic alcohols, including methyl, ethyl, isopropyl, n-propyl, isobutyl, n-butyl, isoamyl, n-amyl and hexyl alcohol, were converted to their acetate, propionate, n-butyrate, isovalerate and caproate esters during incubation with strawberry fruit tissue. Formate, isobutyrate and n-valerate esters were formed when alcohols were incubated together with these fatty acids and strawberry. 70 esters were formed from various combinations of alcohols and acids by means of incubation with strawberry. No ester formation was observed when strawberry was homogenized. AS

85

The influence of processing and maturity on volatile components in bush snap beans, *Phaseolus vulgaris* L.

Toya, D. K.; Frazier, W. A.; Morgan, M. E.; Baggett, J. R.

Journal of the American Society for Horticultural Science 99 (6) 493-497 (1974) [18 ref. En] [Dep. of Hort., Oregon State Univ., Corvallis, Oregon, USA]

Concn. of 17 volatile components in canned, frozen, and fresh green bean pods was determined by GLC. Only 1-octen-3-ol differed quantitatively with cultivar. Almost all volatile components detected in frozen pods were greatly reduced or lost as compared to those in fresh pods. In canned pods most of the "higher boiling" compounds were found to decrease while some "lower boiling" compounds increased considerably. 1-octen-3-ol, a significant component of bean flavour, increased with time after thawing of the frozen samples, while very little change was observed in the concn. of other compounds. In fresh green beans the concn. of 1-octen-3-ol was highest early in pod growth and decreased rapidly through the 21st day after anthesis and attainment of max. marketable pod size. Other compounds identified were acetaldehyde, ethanol, 3-pentanone, n-hexanol, cis-3-hexanol, trans-2-hexanol and linalool. AS

86

[Problems of extraction and analysis of certain flavour compounds in dairy products. I. Techniques of concentration and extraction.] [Review]
Lacrampe, J. L.; Dherbomez, M.; Weber, F.
Lait 55 (548) 517-529 (1975) [105 ref. Fr, en]
[Univ. de Poitiers, Lab. de Biol. et Biochimie, IUT de la Rochelle, Poitiers, France]

The authors review techniques for concentration and extraction of flavour substances from products of high moisture content (head-space GLC; freeze concentration; distillation at atmospheric pressure, with water vapour or under vacuum; entrainment of volatile compounds by a gas stream at normal or reduced pressure; extraction by organic solvents; direct injection) and also from products of high fat content (vacuum distillation techniques; use of acetonitrile in a column filled with the cheese sample and celite, followed by gas chromatography; etc.). Finally the results of application of extraction techniques to milk and cheeses (particularly Cheddar) are discussed. ADL

87

[Problems of extraction and analysis of certain flavour compounds in dairy products. II. Methods of determination.] [Review]
Lacrampe, J. L.; Dherbomez, M.; Weber, F.
Lait 55 (549/550) 630-639 (1975) [69 ref. Fr, en]
[Univ. de Poitiers, Lab. de Biol. et Biochimie, IUT de la Rochelle, Poitiers, France]

Colorimetric and chromatographic methods for detn. of diacetyl, acetoin and acetaldehyde are reviewed. [See preceding abstr. for part I.] ADL

88

[Determination of volatile fatty acids in cultured milk products and cheeses by gas-liquid chromatography.]

Rachev, R.
Khranitelna Promishlenost 24 (8/9) 24-27 (1975) [14 ref. Bg]

A method is described involving steam distillation of volatile fatty acids, neutralization of the distillate to form sodium salts, drying and purification of the latter with a solution of trichloroacetic acid in benzene, and GLC of the benzene solution on a Packard 7400 chromatograph with a flame-ionization detector. Retention times and correction coeff. for the various volatile fatty acids are indicated. A linear relationship was found between flame-ionization detector response and number of C atoms in straight-chain acids (except acetic and capric). In analysis of cultured milk products and cheeses (e.g. Kachkaval) a peak was found with a retention time between capric and caprylic acid; it probably corresponded to isocaprylic acid. ADL

89

Reviews of the progress of dairy science: cheese starters. [Review]
Lawrence, R. C.; Thomas, T. D.; Terzaghi, B. E.
Journal of Dairy Research 43 (1) 141-193 (1976) [477 ref. En]
[New Zealand Dairy Res. Inst., Palmerston North, New Zealand]

Research during the last 12 yr on cheese starters containing mesophilic lactic streptococci and leuconostocs is reviewed, covering composition, growth, effect on cheese flavour, starter proteolysis, carbohydrate metabolism, genetics bacteriophages and starter technology. JMD

90

[Analysis of volatile carbonyl compounds of raw-cured sausage by gas-liquid chromatography.]
Goryaev, M. I.; Kenzhebekov, P. K.; Ul'yanov, S. D.; Sharipov, F. S.
Zhurnal, Kazakhskii Politechnicheskii Institut imeni V. I. Lenina Zernopererabatyvayushchaya i Pishchevaya Promyshlennost' No. 3, 119-123 (1974) [7 ref. Ru]

21 volatile carbonyl compounds, separated from sausage products by vacuum extraction and trapping in a saturated solution of 2,4-dinitrophenylhydrazine in 2N HCl, were identified by GLC (using polyethylene glycol 1540 on Celite 545 and didecylphthalate [? dodecylphthalate] on Chromaton N) and subsequent detn. of the mp of their hydrazones. KME

91

Examination of the diphenylpropanoids of nutmeg as their trimethylsilyl, triethylsilyl and tri-n-propylsilyl derivatives using combined gas chromatography and mass spectrometry.

Harvey, D. J.
Journal of Chromatography 110 (1) 91-102 (1975) [17 ref. En]
[Dep. of Pharmacology, Univ. of Oxford, Oxford OX1 3QT, UK]

Ethyl acetate extracts of 13 samples of nutmeg and 1 sample of mace were examined as trimethylsilyl, triethylsilyl and tri-n-propylsilyl derivatives by GC/MS. 11 compounds derived from 2 types of diphenylpropanoid were identified; the relative proportions and quantities of these compounds varied considerably in the different samples. Single ion chromatograms were used to obtain the relative concn. of one series of compounds. Preparation of the triethylsilyl and tri-n-propylsilyl derivatives resulted in greatly increased separation of the diphenylpropanoids over trimethylsilyl derivatives, which tended to produce a group of compounds with many unresolved peaks. AS

92

Simple solid injection method for qualitative and quantitative estimation of essential oils.

Senanayake, U. M.; Edwards, R. A.; Lee, T. H. *Journal of Chromatography* 116 (2) 468-471 (1976) [15 ref. En] [Dep. of Food Tech., Univ. of New South Wales, PO Box 1, Kensington, NSW 2033, Australia]

A solid injection direct-loading technique is described for determining the gas chromatographic pattern of volatiles recovered from thin pieces of cinnamon stem bark; results compared well, both qualitatively and quantitatively, with solvent extraction. The technique is extremely rapid and reproducible; it also gave good results with cinnamon root bark and leaves and other fresh and dried plant material, and the residue is easily recovered for further analysis. AL

93

[Food aroma components. II. Aliphatic compounds.] Aroma-Lebensmittelbestandteile, II. Aliphatische Verbindungen. [Review]

Bajaj, K. L.; Bhatia, I. S. *Riechstoffe, Aromen, Körperpflegemittel* 26 (1) 8-10 (1976) [48 ref. De] [Tea Res. Ass., Biochem. Dep., Tocklai Exp. Sta., Jorhat-785008/Assam, India]

This review of food aroma components is continued with a discussion of the role of aliphatic lipids (hydrocarbons, alcohols, esters, aldehydes, ketones and lactones), esters, proteins and S-compounds as flavour components or precursors. [See FSTA (1975) 7 12T595 for part I.] RM

94

[Effect of microelements on some volatile components of grapes and wine.]

Gadzhiev, D. N.; Izmailova, M. M. *Vinodelie i Vinogradarstvo SSSR* No. 6, 57-58 (1975) [Ru] [Dagestanskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

The elements discussed are B, Mn, Mo, Zn, Co and Be. The taste of white table wine, as affected by the contents of B, Mo and Zn, was to some extent correlated with the contents of isoamyl acetate, ethyl lactate, diethyl succinate, ethyl capronate, isoamyl caprylate and β -phenylethanol in the wine. High concn. of n-pentanol, 2-methyl-1-butanol, methyl acetate and ethyl formate produced, in the presence of Mn, Co and Be (in combination with B), a favourable effect on the taste and aroma of Cabernet-type red table wines. STI

95

Analytical methods for polyphenols in brewing. IV. High vacuum separation coupled with chromatography.

Belleau, G.; Dadic, M. *Proceedings. American Society of Brewing Chemists* 5[?32] (1) 5-8 (1974) [9 ref. En] [Molson

Breweries of Canada Ltd., Montreal, Quebec, Canada]

High vacuum separation (HVS) of beer flavour components is described, with operating details and a diagram of the apparatus. The method employs fractionation of components under very high vacuum (10^{-5} mm Hg using a Hg diffusion pump) and selective volatilization at temp. increasing to just below their mp or decomposition point. The method achieves sublimation of substances which cannot be volatilized by gas chromatography. 18 previously identified phenolic monomers and their oxidized counterparts were purified by HVS, and lyophilized beer solids and a concentrate of phenolics extracted with ethyl acetate were also separated into sublimates and non-sublimate residues. Phenolic and cinnamic acids were completely separated without decomposition, followed by further fractionation using 2-dimensional TLC and high performance liquid chromatography. 10 phenolic and cinnamic acids were identified in beer, of which the most abundant were ferulic and vanillic acids. The non-sublimated residues are still under investigation. ELC

96

Temperature programmed analysis of essential oils using glass capillary columns.

Kugler, E.; Langlais, R.; Halang, W.; Hufschmidt, M. *Chromatographia* 8 (9) 468-473 (1975) [15 ref. En] [Coca-Cola GmbH, D-4300 Essen, Federal Republic of Germany]

The usefulness of averaging data for improving the reproducibility of the retention indices and peak area % from repeated temp. programmed analyses was studied. All calculations were performed by an off-line computer system. SD and 95% tolerance limits for each peak area % in multiple analyses were readily provided and stray values eliminated by means of the t-test. The procedure was used to study the long term stability of cold-pressed Californian lemon oil under deep-freeze, refrigerator and room-temp. conditions. All but 4 values of the chromatographic runs from 4 month and 8 month old samples were within the 95% tolerance limits of the peak areas of fresh material, and no differences were detected in organoleptic tests. RM

97

[Volatile aroma components of peach (*Prunus persica*). Determination of γ -lactones by GLC.]

Molina, P.; Soler, A.; Cambronero, J. *Anales de Bromatologia* 25 (4) 403-410 (1973) [9 ref. Es, en] [Dep. de Quimica Organica, Fac. de Ciencias, Univ. de Murcia, Spain]

The γ -lactones in peach essence var. Jeronimo were determined by GLC on Apiezon L, Carbowax 20M and capillary Carbowax 20M columns. γ -octa-, deca- and dodeca lactones were identified, γ -valero- and undecalactone were absent, and γ -hexa-, hepta- and nona lactones doubtful. The dodeca lactone was the main component. [See also FSTA (1975) 7 9J1320.] RM

98

[Improving the production of essential oil of orange. I. First extraction tests using the terpene fraction of the same oils as solvents.]

Benedito, J.; Lafuente, B.; Jorro, M.; Primo, E. *Revista de Agroquímica y Tecnología de Alimentos* 15 (2) 256-264 (1975) [6 ref. Es, de, en, fr] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

The yield of essential oil obtained by cold pressing of orange peel scrapings by in-line extraction is usually 25-30%, occasionally 50%. In order to recover residual oil lost in the pressed scrapings, extraction by the terpene fraction (mainly d-limonene) obtained from dewatering of the essential oil was investigated. The pressed scrapings were extracted in 3 successive stages with 7.5% wt./wt. of the terpene fraction, and pressed. Results with Comuna oranges suggested that the process doubled the total yield. Recovered oils contained 1.04 g/100 ml aldehydes and ketones, and 93.8 mg/100 g carotenoids, vs. 1.12 g/100 ml and 130.2 mg/100 g in oil from the first pressing. GLC patterns of the oxygenated fractions of both oils are very similar with only slight quantitative deviations. RM

99

[The main volatile components of Agen prunes.]

Moutounet, M.; Dubois, P.; Jouret, C.

Comptes Rendus des Seances de l'Academie d'Agriculture de France 61 (10) 581-585 (1975) [13 ref. Fr] [Lab. de Tech. des Produits Vegetaux, Cent. de Recherches de Toulouse, INRA, BP 12, 31320 Castanet Tolosan, France]

Volatile components (hydrocarbons, carbonyls, alcohols, esters, terpenes, and a single lactone, amine and S-compound) were extracted from dried Agen prunes by Freon II, identified by MS-GLC and tabulated. The characteristic odour of the prunes was enhanced by NaCl and lost after reaction of carbonyls with hydroxylamine, suggesting that they are responsible for the aroma. RM

100

[High vacuum technique for the study of aromatic compounds in cereal products.]

Skladalova, J.

Mlynsko-Pekarensky Prumysl 21 (11) 353-355 (1975) [15 ref. Cs] [Vyzkumny Ustav Mlynskeho a Pekarenskeho Prumyslu, Prague, Czechoslovakia]

Using the high vacuum technique, the less volatile compounds (e.g. pyridine and pyrazine derivatives) were isolated from cereal products at low pressures and low temp. (-196°C). The pumping equipment and glass apparatus are described in detail as well as the method of trapping the isolated components and analysis using gas chromatography. Milk-containing bakery products, T930 rye flour and wholemeal rye flour were used for testing purposes. The results were compared with those of sensory evaluation.

Optimal isolation conditions were established as well as differences in the spectra of isolated compounds. Individual components have yet to be identified and their contribution to the total aroma determined. STI

101

[Studies on changes of whey proteins by heat treatment. VII. Production of volatile carbonyl compounds from whey by heating.]

Nakanishi, T.; Wada, Y.

Japanese Journal of Dairy Science [Rakuno Kagaku no Kenkyu] 24 (3) A113-A116 (1975) [4 ref. Ja, en] [Lab. of Chem. & Tech. of Anim. Products, Fac. of Agric., Tohoku Univ., Sendai, Japan]

Following heat treatment at 150°C for 30 min of whey dialysed against distilled water or against skim-milk, formaldehyde, acetaldehyde, acetone or propionaldehyde, butyraldehyde, pentaldehyde and heptanone were identified by GLC. With heat treatment at 160°C for 30 min, the peaks of pentaldehyde and heptanone decreased and that of acetaldehyde increased. Following heat treatment of 0.3% whey proteins solution at 150°C for 30 min, the GLC peak of heptanone was very low; after heating at 160°C for 30 min the pentaldehyde peak decreased and the heptanone peak disappeared. [From En summ.] [See FSTA (1976) 8 2P214 for part VI.] DMK

102

Analytical evaluation of seasoning extracts oleoresins and essential oils from seasonings. III. Salzer, U.-J.

International Flavours and Food Additives 6 (5) 253-258 (1975) [142 ref. En] [Haarmann & Reimer, D-345 Holzminden, Federal Republic of Germany]

This analytical evaluation continues with seasoning extracts for which the analytical criteria are the essential oil and other components. Consideration is given to 3 seasonings which fall into this group: garlic, onion and cinnamon. After consideration of various methods it is recommended that as a basis for the assessment of onion and garlic extracts the following values be determined: water content by azeotropic distillation using xylene; direct reducing and total sugar contents determined by the Luff-Schoorl method; flavour content, by gas chromatography, with the aid of an internal standard, after distillation; and colour content using a conventional comparator method. For analysis of pure essential oil, the disulphide content determined by IR spectroscopy is recommended as a suitable characterising value. It is recommended that for the objective assessment of Chinese cinnamon (cassia) extract, the following criteria are proposed: determination of the essential oil and gas chromatographic separation of the most important components, cinnamaldehyde, eugenol and benzaldehyde, or direct determination of the aldehyde in the extract by the hydroxylamine method; and determination of the coumarin content using AOAC Method No. 19008-11. [See FSTA (1976) 8 4T167 for part II]. VJG

103

Volatile compositional differences between cultivars of black pepper (*Piper nigrum*).

Russell, G. F.; Else, J.

Indian Spices 12 (1) 4-11 (1975) [3 ref. En]
[Dep. of Food Sci. & Tech., Univ. of California,
Davis, California 95616, USA]

See FSTA (1973) 5 8T396.

104

Chemical and physical methods used to isolate and identify food flavours.

Teranishi, R.

Abstracts of Papers, American Chemical Society
171 (Centennial), AGFD 21 (1976) [En]
[USDA, 800 Buchanan Street, Albany, California
94710, USA]

105

[Effects of process conditions on aroma retention during drying of fluid foods.]

Thijssen, H. A. C.

Voedingsmiddelentechnologie 8 (36) 9-15 (1975)
[20 ref. Nl, en] [Tech. Hogeschool, Eindhoven,
Netherlands]

The loss of aroma compounds from fluid foods, during spray-drying, drum-drying and freeze-drying is discussed. Aspects considered include: basic principles; molecular transport of water and aroma compounds (with reference to binary and 3-component diffusion models); theoretical prediction of effects of process conditions on aroma retention during drying; and experimentally-observed effects of drying conditions. AJDW

106

[Extraction and isomerization of bitter substances of hops.]

Soberka, R.

Bios 6 (11) 378-389 (1975) [37 ref. Fr, de, en]
[Brasseries Lorraines, 08 Sedan, France]

An aqueous hop extract was prepared by homogenizing the hop cones with a suspension of 800 g kieselguhr/hl water. The hop/kieselguhr suspension was autoclaved for 90 min at a temp. of 112°C to obtain max. yield of iso- α -acids. In laboratory tests, comparisons of the classical hopping method (using 150 g whole cones/hl) with the hop/kieselguhr suspension method (using 105 g hops/hl) showed that the latter gave a 20% increase in hop yield with hot hopping and a 28.4% increase with cold hopping. The hop saving was 35 and 50% for the hot and cold processes, respectively. Differences between beers prepared by classical and cold hopping processes are discussed. MEG

107

On the analysis of oil in green coffee beans.

Folstar, P.; Pilnik, W.; Heus, J. G. de; Plas, H. C. van der

Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene 66 (4) 502-506 (1975) [6 ref. En, de, fr] [Agric. Univ., Wageningen, Netherlands]

Green coffee beans (Colombian *C. arabica*) were coarsely ground (CG) with an 'Olland' disc crusher and extracted with petroleum ether either directly or after acid treatment. A portion of the CG beans was ground more finely in a 'Retsch' ultracentrifugal mill equipped with an 0.50 mm sieve. Direct extraction of the oil from the finely ground (FG) beans was complete in 6 h, whereas under similar conditions only 50% extraction of the CG beans was obtained. The oil from the CG beans had a higher % unsaponifiable matter and differed in its fatty acid composition from that given by the oil from the FG beans. From comparisons of the % oil extracted directly from several sieve fractions (0.15-0.85 mm) with that determined after acid treatment of these fractions it is concluded that the sieve fraction with particle size 0.15-0.42 mm was most suitable for total coffee oil analysis. It is not necessary to preheat the grind before extraction. MEG

108

[Chemical composition of substances contributing to champagne wine bouquet.]

Rodopulo, A. K.; Egorov, I. A.; Kormakova, T. A.
Lozarstvo i Vinarstvo 24 (7) 35-41 (1975) [Bg]

The volatile compounds were determined and identified by gas chromatography. The highest-quality wines contain 114-190 mg/l. isopentanol; good wines contain 210-230 mg/l., average-quality wines contain 270-384 mg/l. Similar relations exist for ethyl acetate (12-22 and 33.40 mg/l. for excellent and good wines). Ethyl lactate is of importance for the bouquet and flavour, in concn. of about 100 mg/l. Other esters which improve the wine properties are isoamyl capronate and octylphenyl acetate. A salty aftertaste is due to ethyl linoleate, which is released, simultaneously with farnesol, during yeast cell autolysis. The lower the content of higher alcohols and highly volatile esters and the higher the concn. of high bp esters and terpenic substances, the higher the quality of the wine. STI

109

[Data on the composition of volatile compounds in distillates in relation to mash column height.]

Kiryachkova, V. T.; Protsyk, T. B.; Yushchenko, N. M.; Stabnikov, V. N.

Fermentnaya i Spirtovaya Promyshlennost' No. 6, 12-14 (1975) [6 ref. Ru] [KTIPP, USSR]

Data are presented on the qualitative and quantitative composition of volatile compounds of the liquid phase in relation to the height of the

mash column, together with the results of an analysis of the mash and the mash distillation product. Model aqueous-alcohol solution were studied for their organoleptic properties at threshold concn. of the volatile components (diethyl ether, ethyl acetate, methyl acetate, acetaldehyde, butyric aldehyde, n-propanol, isobutanol, n-butanol, isoamylol, and valeric, butyric, isovaleric, acetic, propionic, isobutyric and capronic acids). Graphs are presented to characterize the shift and distribution of the above substances with column height. Materials which adversely affect taste and aroma are entrained in considerable amounts by the mash distillate on to the epuration column. STI

110

[Recovery of aromatic substances from orange juice.]

Giannone, L.; Apostolo, A.; Gherardi, S.
Industria Conserve 50 (4) 267-271 (1975) [21 ref. It, de, en, fr] [Sta. Sperimentale per l'Ind. delle Conserve Alimentari, Parma, Italy]

The possibility of recovering volatile components of orange juice from vapours produced during concn., and the effect of adding recovered volatiles to conc. juice were studied. The chemical and organoleptic properties of juice conc. by evaporation to 20, 50 or 70% optical residue, with or without added volatiles, were compared with juice conc. by reverse osmosis. Results of chemical and GLC analyses showed that a large part of the volatiles could be recovered, though recovery of the water-soluble low mol. wt. compounds was difficult and incomplete. Addition of 10 ml/l. aroma concentrate to conc. orange juice did not restore the taste and odour of fresh juice. No significant differences were observed in taste and odour of reverse osmosis juice, juice enriched with 70% optical residue and "cut-back" (diluted with fresh juice instead of water) juice. RM

111

[Study of some volatile components of oak wood.]

Egorov, I. A.; Pisarnitskii, A. F.; Zinkevich, E. P.; Gavrilov, A. I.

Prikladnaya Biokhimiya i Mikrobiologiya 12 (1) 108-112 (1976) [14 ref. Ru, en] [Inst. Biokhimii imeni A. N. Bakha AN USSR, Moscow, USSR]

Crimean oak wood was ground in a ball mill and extracted by shaking for 5 h each time consecutively with ethanol and chloroform/methanol (6:4). The extracts were concentrated, filtered and steam-distilled, the distillate was extracted with diethyl ether, the extract was concentrated and fractionated by TLC and also examined by chromat-mass spectrometry. Results are tabulated and chromatograms are presented; cis- and trans- β -methyl- γ -octalactone, acrolein, crotonic aldehyde, furfural, hexenal, phenylethanol and phenol, m-cresol, guaiacol, o-ethylphenol, p-ethylphenol, and p-cresol were identified. SKK

112

[Recent progress in the analysis of gums and water-soluble natural vegetable colloids. II. Carob flour.]

Artaud, J.; Estienne, J.; Cas, M.

Annales des Falsifications et de l'Expertise Chimique 69 (737) 23-45 (1976) [17 ref. Fr]

[Inst. Univ. de Tech. Rue des Geraniums, 13337 Marseille, Cedex 3, France]

Carob flour (0.5%) was hydrolysed with N H_2SO_4 for 4 h at 100°C and the sugar content determined by GLC analysis of the trimethyl silyl derivatives of the aldoses or alditols or of the alditol acetates. 3 samples of carob flour (numbers 73, 74 and 75) were examined. Each contained about 75% mannose and 25% galactose with a small quantity of arabinose. The 0.7% ether soluble material present in the carob flour contained a high proportion of palmitic and oleic acids. Flours 73 and 74 were considered to be of good quality; these contained 1.25 and 0.98% ash. Sample 75, which was of poorer quality, contained 3.45% ash. The mineral contents (as mg/100 g) were: Ca 102, 82 and 486; Mg 54, 47 and 156; Na 14.4, 14 and 6.1; K 37, 22 and 77; SO_4^{2-} 460, 950 and 300; PO_4^{3-} 64, 41 and 183; Cl⁻ 60, 28 and 60 for samples 73, 74 and 75 respectively. Full details of the analytical techniques used are given. [See FSTA (1975) 7 11T549 for part I.] MEG

113

Identification of some volatile compounds from *Citrullus vulgaris*.

Kemp, T. R.

Phytochemistry 14 (12) 2637-2638 (1975) [11 ref. En] [Dep. of Hort., Univ. of Kentucky, Lexington, Kentucky 40506, USA]

Volatile compounds from watermelon (*Citrullus vulgaris*), obtained by vacuum steam distillation-extraction of the fruit at 60-70° in a water-recycling apparatus, were separated by gas chromatography and subjected to spectral analyses. Evidence was obtained for the following new constituents, hexanal, trans-2-heptenal, trans-2-octenal, nonanal, trans-2-nonenal, trans,cis-2,6-nonadienal, nonan-1-ol, trans-2-nonen-1-ol, cis-3-nonen-1-ol, trans,cis-2,6-nonadien-1-ol, trans-2-decenal, trans-2-undecenal, geranial and β -ionone. AS

114

Volatile components of pecan leaves and nuts, *Carya illinoensis* Koch.

Mody, N. V.; Hedin, P. A.; Neel, W. W.

Journal of Agricultural and Food Chemistry 24 (1) 175-177 (1976) [11 ref. En] [Boll Weevil Res. Lab., USDA, Mississippi State, Mississippi 39762, USA]

The volatile constituents of leaves and immature pecan nuts (including the shucks) were analysed by GLC-MS 38 compounds were found including 7 monoterpene hydrocarbons, 7 sesquiterpene hydrocarbons, 11 terpene alcohols, 1 terpene aldehyde, 1 terpene ketone, and 11 other aldehydes, ketones, alcohols, and esters. AS

115

Flavor chemistry of fruits and vegetables.

Nursten, H. E.

Abstracts of Papers, American Chemical Society 171 (Centennial), AGFD 24 (1976) [En] [Procter Dep. of Food & Leather Sci., Univ., Leeds LS2 9JT, UK]

Recent advances in the subject are reviewed with particular emphasis on compounds of sensory significance including: the chemistry and biosynthesis of interesting new compounds; the significance of known precursors and enzyme systems; varietal differences and the effects of growing conditions; and the changes due to ripening and processing and to storage. AS

116

[The study of techniques of retention of volatile components of aroma of freeze-dried apple puree.] Popovskii, V. G.; Grinberg, N. Kh.; Zhdanova, T. A.

Konservnaya i Ovoshchesushil'naya Promyshlennost' No. 11, 40-41 (1975) [Ru] [Moldavskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

Freeze-dried apple puree has a water-soluble fraction (saccharides, acids) and a water-insoluble fraction (cellulose, pectin). Sorption of aroma volatile components was studied for each fraction. The fractions were separated centrifugally with repeated washing with water. The former fraction was concentrated by freezing to 12% DM; the original puree had 12% water-soluble DM. The 2 fractions were blended in the experiments in 3 different ratios. The mixture of aroma components was added to puree thus treated: butyl acetate and isoamyl acetate, and isoamyl alcohol. The samples were frozen and freeze-dried. The aromatic substances were determined by gas chromatography. The curves show that as DM in the puree increased (from 2 to 12%) content of aromatic substances decreased on freeze-drying. This relationship is more pronounced in alcohols than in esters. The graph shows the relationship between content of aromatic substances and the apparent density of the fractions, with different DM in the water-soluble portion of the puree. The relationship is linear. The sorption of the aroma depends on the porousness and surface of the product. During storage of the dried puree the aroma is retained on the crystalline structure of the water-soluble fraction. STI

117

Analytical aspects of capillary gas chromatography of lower fatty acids [up to C₁₈].

Krupcik, J.; Hrivnak, J.; Janak, J.

Journal of Chromatographic Science 14 (1) 4-17 (1976) [123 ref. En] [Dep. of Analytical Chem., Fac. of Chem. Tech., Slovak Tech. Coll., Bratislava, Czechoslovakia]

Interlaboratory exchange of retention data has problems of defined temp. in commercial

thermostated air baths, of capillary tubing, and of stationary phases. A modification of commercial thermostats has been proposed to secure a defined temp. for glass capillary columns. Retention data of fatty-acid methyl esters can be measured under standard conditions with the same accuracy as for hydrocarbons on squalene. Metal capillary columns coated with Apiezon L were unsuitable for the analysis of fatty-acid methyl esters from butterfat compared with packed Apiezon L and polar capillary columns. A program in FORTRAN IV language is given for the calculation of Kovats' retention indices for fatty-acid methyl esters. AS

118

Is there a correlation between organoleptic and chemical procedures for the assessment of lipolysis? [Lecture]

Kuzdal-Savoie, S.

Annual Bulletin, International Dairy Federation No. 86, 165-170 (1975) [18 ref. En] [Sta. de Recherches Laitieres, CNRZ-INRA, 78350 Jouyen-Josas, France]

The relationship between free fatty acids in milk fat and rancid flavours is reviewed. The C10-C12 acids and the sodium salts of C8-C14 acids have a soapy taste, and it is the C10 acid which first exceeds the perception threshold during lipolysis in milk. [See FSTA (1976) 8 8P1414.] JMD

119

The role of sulfur compounds in food flavor. III. Thiols. [Review]

Maga, J. A.

CRC Critical Reviews in Food Science and Nutrition 7 (2) 147-192 (1976) [134 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado, USA]

Thiols are a further class of sulphur containing compounds that have been associated with food flavour. It is the purpose of this review to summarize the food systems and specific thiols isolated, their sensory properties, formation pathways, methods of synthesis and analysis techniques. Both aliphatic thiols and thiol derivatives are covered. [See FSTA (1976) 8 3A133 for part II.] AS

120

Volatile heterocyclic compounds in the reaction of glyoxal with glycine.

Velisek, J.; Davidek, J.; Cuhrova, J.; Kubelka, V. *Journal of Agricultural and Food Chemistry* 24 (1) 3-7 (1976) [52 ref. En] [Dep. of Food Chem. & Analysis, Chem. Tech. Univ., Suchbatarova 1903, 16628 Prague, Czechoslovakia]

The basic fraction of the volatiles from an equimolar glyoxal-glycine mixture heated under reflux for 4 h was separated by gas chromatography. Carbonyls were converted to their 2,4-dinitrophenylhydrazones and separated by TLC. Individual components were isolated and analysed by MS, and UV, visible and IR

spectrophotometry. 6 N-containing heterocycles (pyrazine, methyl-, 2,5-dimethyl-, 2,6-dimethyl-, and trimethylpyrazine, and 2-pyrrolaldehyde) were positively identified. Formaldehyde was found as the only carbonyl group containing reaction product. A possible precursor, aminoacetaldehyde, was synthesized and the formation mechanism of pyrazines and pyrrole is presented. [See also FSTA (1972) 4 11A509.] AS

121

[Quantitative determination of volatile trace components in foods by adsorption chromatography and gas chromatography-mass spectrometry.] Quantitative Bestimmung flüchtiger Spurenkomponenten in Lebensmitteln mit der Adsorptions-Chromatographie und Gas-Chromatographie-Massenspektrometrie. Scheier, P.; Drawert, F. *Zeitschrift für Analytische Chemie* 279 (2) 141-142 (1976) [2 ref. De] [Inst. für Lebensmittelchem. & Analytische Chem., Tech. Univ. Munich, Freising-Weihenstephan, Federal Republic of Germany]

A quantitative method is described for det. of volatile trace components in foods. It is based on the sequence of analytical steps developed by the authors for qualitative purposes using the techniques named in the title [see FSTA (1974) 6 9H1539 & (1975) 7 5H701]. SKK

122

Bibliography of paper and thin-layer chromatography 1970-1973 and survey of applications.

Macek, K.; Hais, I. M.; Kopecky, J.; Schwarz, V.; Gasparic, J.; Churacek, J. (Editors) *Journal of Chromatography* Suppl. Vol. No. 5, xviii + 744pp. ISBN 0-444-41299-9 (1976) [5601 ref. En]

This supplementary volume comprises a general bibliography section on techniques of paper chromatography and TLC, and a special part containing references to specific compounds including applications in various foods and food products, milk and milk products. An author and subject index is included. AK

123

[Breakdown of linoleic acid hydroperoxides to volatile monocarbonyl compounds.] Abbau von Linolsäurehydroperoxyden zu flüchtigen Monocarbonylverbindungen.

Grosch, W. *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 160 (4) 371-375 (1976) [13 ref. De, en] [Deutsche Forschungsanstalt für Lebensmittelchemie, Leopoldstr. 175, D-8000 Munich, Federal Republic of Germany]

Linoleic acid hydroperoxides (LOOH) containing 13-hydroperoxyoctadeca-9,11-dienoic acid (75%) and 9-hydroperoxyoctadeca-10,12-dienoic acid (25%) were emulsified at pH 6.5. After addition of haemoglobin, ferrous ions, ferric ions,

cysteine or ascorbic acid the emulsions were stored for 19 h at 22°C. The decrease in diene and peroxide concn. and the formation of volatile carbonyl compounds were studied. Ferrous ions and ascorbic acid were the strongest producers of volatile carbonyl compounds. In the presence of 10^{-3} mol ascorbic acid, 6 μ mol volatile aldehydes were produced from 75 μ mol LOOH. Hexanal (70 mol-%) was the main component of the aldehyde fraction. The significance of the reaction of fatty acid hydroperoxides with ascorbic acid for the formation of flavour substances in foods of plant origin is discussed. AS

124

Symposium on computers in flavor chemistry. [Conference proceedings]

Pattee, H. E.; Cram, S. P. (United States of America, American Chemical Society, Agricultural & Food Chemistry Division; United States of America, American Chemical Society, Analytical Chemistry Division) (Chairmen)

Journal of Agricultural and Food Chemistry 22 (5) 735-770 (1974) [many ref. En] [N. Carolina State Univ., Raleigh, N. Carolina 27607, USA]

This symposium formed part of the 166th National Meeting of the American Chemical Society, held in Chicago, Illinois in Aug. 1973. Abstracts of some of the papers have already been covered by FSTA. Papers included: The state of laboratory automation, by C. E. Klopfenstein (pp. 736-739, 6 ref.); Combination rules for judgments of odor quality difference, by H. R. Moskowitz (pp. 740-743, 8 ref.); Refining of methods for subjective-objective evaluation of flavor, by J. J. Powers & M. C. Quinlan (pp. 744-749, 25 ref.) [see FSTA (1974) 6 1A2]; A combined gas chromatography-mass spectrometry-computer system for the analysis of volatile components of foods, by C. Merritt Jr., D. H. Robertson, J. F. Cavagnaro, R. A. Graham & T. L. Nichols (pp. 750-755, 10 ref.) [see FSTA (1973) 5 12A524]; An information acquisition and utilization system for the flavor chemist, by W. G. Galetto & W. H. Stahl (pp. 755-757, 1 ref.) [see FSTA (1974) 6 1A1]; Seasonal variations in the composition of the volatile constituents of black tea. A numerical approach to the correlation between composition and quality of tea aroma, by M. A. Gianturco, R. E. Biggers & B. H. Ridling (pp. 758-764, 18 ref.) [see FSTA (1973) 5 12H1922]; and Some aspects of high-resolution gas chromatographic analysis of complex volatile samples, by M. Novotny, M. L. McConnell & M. L. Lee (pp. 765-770, 43 ref.) [see FSTA (1974) 6 1A8]. JA

125

Progress towards an international system of beer flavor terminology.

Clapperton, J. F.; Dalglish, C. E.; Meilgaard, M. C.

Technical Quarterly, Master Brewers Association of America 12 (4) 273-280 (1975) [21 ref. En, es] [Brewing Ind. Res. Foundation, Nutfield, Redhill, Surrey, UK]

See FSTA (1976) 8 8H1323.

126

Classification of lager beers by computer analysis of volatile profiles.

Hoff, J. T.; Helbert, J. R.; Chicoye, E.

Technical Quarterly, Master Brewers Association of America 12 (4) 209-213 (1975) [15 ref. En, es] [Miller Brewing Co., Milwaukee, Wisconsin, USA]

Computer identification and classification of beer is demonstrated with the aid of stepwise discriminant analyses of volatile profiles obtained from either CS₂ extractables or headspace vapours. Identification and classification of known and unknown samples of competitor beers, branch plant beers, and beers differing in amounts and kind of adjuncts used are discussed. The use of the above technique for evaluating product uniformity between plants is also discussed. AS

127

[Composition for chemical analysis of wine and brandy components.]

Nechaev, N. N.; Khiabakhov, T. S. (Union of Soviet Socialist Republics, Vsesoyuznyi Nauchno-issledovatel'skii Institut Vonnigradarstva i Vinodeliya)

USSR Patent 502 321 (1976) [Ru]

A composition for more effective chromatographic analysis contains 64-72 wt. % polyethyleneglycol-600, 26.5-33.5 wt. % 1,2,3-tris(β-cyano-ethoxy)-propane and the remainder Reopleks-400. W&Co

128

Aging of wine: qualitative changes in the volatiles of Zinfandel wine during two years.

Stern, D. J.; Guadagni, D.; Stevens, K. L.

American Journal of Enology and Viticulture 26 (4) 208-213 (1975) [49 ref. En] [USDA, Berkeley, California 94710, USA]

Zinfandel wine (1969) was analysed periodically for changes in volatile composition during ageing, starting with the newly fermented must and every 3 months thereafter for the first year. The most significant changes occurred at 6 months, coinciding with completion of the malo-lactic fermentation. Approx. 20 compounds not found earlier were identified after 6 months' storage. AS

129

Some features of the aroma compounds of alcoholic beverages. [Lecture]

Suomalainen, H.; Lehtonen, M.

Kemia-Kemi 3 (2) 69-77 (1976) [59 ref. En] [Res. Lab., State Alcohol Monopoly (Alko), Box 350, SF-00101 Helsinki 10, Finland]

This review contains the following sections: fatty acid esters; the role of yeast; fatty acids; fusel alcohols; carbonyl compounds and acetals; phenolic compounds; lactones; S compounds; and N compounds. JA

130

[2,5-dimethyl-4-methoxy-2,3-dihydro-3-furanone, the compound responsible for the characteristic odour of Arctic bramble (*Rubus arcticus* L.).]

Honkanen, E.; Kallio, H.; Pyysalo, T.

Kemia-Kemi 3 (4) 180-181 (1976) [13 ref. Fi] [1 Valtion Teknillinen Tutkimuskeskus Elintarvikelaboratorio, Espoo, Finland]

131

The aroma of cloudbberries (*Rubus chamaemorus* L.).

Honkanen, E.; Pyysalo, T.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 160 (4) 393-400 (1976) [22 ref. En, de] [Tech. Res. Cent. of Finland, Food Res. Lab., SF-02150 Espoo 15, Finland]

The volatile components of cloudbberries were analysed by gas chromatography and MS. About 80 components, comprising 93% of the aroma concentrate, were identified. The aroma of cloudbberries is characterized by the presence of aromatic compounds, which constitute about 53% of the essential oil. The content of terpenes is only 1.5%. % concn. of the main components are given. AS

132

Identification of volatile constituents from grapes.

Schreier, P.; Drawert, F.; Junker, A.

Journal of Agricultural and Food Chemistry 24 (2) 331-336 (1976) [64 ref. En] [Inst. für Lebensmitteltech. und Analytische Chem., Tech. Univ., Munich, Federal Republic of Germany]

The volatile constituents of grapes (var. Riesling, Traminer, Ruländer, Müller-Thurgau, Scheurebe, Optima, and Rieslaner, harvested 1972-1974) were isolated under enzymic inhibition, enriched by liquid-liquid extraction (pentane-methylene chloride, 2:1), and fractionated on silica gel. Analysis by gas chromatography and coupled GLC-MS led to the identification of 225 aroma compounds that included 81 hydrocarbons, 48 acids, 31 alcohols, 23 aldehydes, 18 ketones, 11 esters, and 13 constituents of miscellaneous structures. 81 aroma substances were identified for the first time in a grape aroma. The MS identifications were confirmed by matching retention indices. AS

133

[Determination of tyramine, histamine and tryptamine in some French cheeses.]

Colonna, P.; Adda, J.

Lait 56 (553/554) 143-153 (1976) [15 ref. Fr, en] [Sta. Cent. de Recherches Laitieres et de Tech. des Produits Animaux, CNRZ, 78350 Jouy-en-Josas, France]

73 samples of factory and farm cheeses, mostly of known origin and age, made from raw or pasteurized milk, were studied by a fluorescence method. Results are discussed for the cheeses

grouped into 6 types. It was found in general that tyramine was a much more important constituent than tryptamine and histamine. Free histidine levels were in all cases higher than those of tyrosine. Certain cheeses (Roquefort, Comté) appeared to have higher amine contents than other cheeses of the same age, made by similar processes (Bleu, Beaufort). Soft washed-rind cheeses (e.g. Pont l'Évêque) had consistently lower amine contents than soft surface-mould cheeses (Camembert). Only the pressed cheeses (St-Nectaire and Cantal) and Beaufort appeared to be free from risk of reactions to amines in consumers. ADL

134

Volatile terpenes in California bay foliage. Changes in composition during maturation.

Kepner, R. E.; Ellison, B. O.; Breckenridge, M.; Connolly, G.; Madden, S. C.; Muller, C. J.

Journal of Agricultural and Food Chemistry 22 (5) 781-784 (1974) [21 ref. En] [Dep. of Chem., Univ. of California, Davis, California 95616, USA]

Volatile components of leaves of California bay, *Umbellularia californica*, isolated by steam distillation and ether extraction, were separated by column and preparative gas chromatography. Individual components were characterized by MS and IR spectroscopy, and by determination of Kovats indices. 21 compounds were identified, the ones present in greatest abundance being umbellulone, 1,8-cineole, α -terpineol, sabinene, terpinen-4-ol, and methyl eugenol. The compositions of volatile components in the essential oils from California bay new leaf growth and year-old growth were investigated over a growing season. A general trend observed in analyses of the old growth samples was a continual decrease in the level of volatile terpenes from the first sampling in early April until the middle of June, followed by an increase in amounts until the termination of the study in Aug. The amounts of all components in new leaf growth, initially very small relative to the amounts of the same components in mature growth, increased slowly through the first 4 wk and then rapidly thereafter to the point where most components were, by the end of the study, present in greater concn. in new than in old growth. AS

135

California bay oil. I. Constituents, odor properties.

Buttery, R. G.; Black, D. R.; Guadagni, D. G.; Ling, L. C.; Connolly, G.; Teranishi, R.

Journal of Agricultural and Food Chemistry 22 (5) 773-777 (1974) [12 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

The steam volatile oil of the leaves of the California 'bay' tree (*Umbellularia californica*) was analysed by capillary and packed column gas chromatography separation with characterization by MS and IR spectrometry. The characterizations of the major components umbellulone (39%), 1,8-cineole (19%), α -terpineol (7.6%), terpinen-4-ol (6.2%), sabinene (6%), α -pinene (4.7%), and 3,4-dimethoxyallylbenzene (5.4%) were confirmed and 26 additional compounds also characterized. Odour

threshold studies indicated that 1,8-cineole was by far the major contributor to the odour of dilute water solutions of the oil. Comparison of the composition and odour properties was made with other well-known 'bay' oils from the leaves of Mediterranean bay (*Laurus nobilis*) and West Indian bay (*Pimenta racemosa*). [See also FSTA (1974) 6 1T9]. AS

136

Application of mass spectrometry to the measurement of dissolved gases and volatile substances in fermentation.

Reuss, M.; Piehl, H.; Wagner, F.

European Journal of Applied Microbiology 1 (4) 323-325 (1975) [3 ref. En] [Gesellschaft für Molekularbiologische Forschung mbH Stöckheim/Braunschweig, Federal Republic of Germany]

137

Psychometric analysis of food aromas by profiling and multidimensional scaling.

Moskowitz, H. R.; Barbe, C. D.

Journal of Food Science 41 (3) 567-571 (1976) [12 ref. En] [Food Sci. Lab., US Army Natick Development Cent., Natick, Massachusetts 01760, USA]

Panelists evaluated 20 commercial food aromas by 2 procedures: profiling and estimation of overall qualitative dissimilarity. The scaling procedure of magnitude estimation was used for each task. Profiling produced unique signatures of attributes for each aroma, and illustrated variations in quality. Estimates of qualitative dissimilarity were treated as 'inter-stimulus' distances, and the method of multidimensional scaling was used to develop geometrical maps in which both aromas and descriptor terms were placed. These maps revealed that: aromas and descriptors (one's concept of an 'ideal' aroma) were fairly close to each other for fruit aromas, but often diverged for meats; a pictorial representation of the qualitative dissimilarity (and similarity) of aromas and descriptors can be easily produced; and individuals perceive qualitative differences in aromas in similar ways. IFT

138

Stimulus - sensation - satisfaction. New wing inauguration symposium September 16-18, 1974.

[Conference proceedings]

Sweden, Svenska Institutet för Konserveringsforskning

SIK Rapport No. 389, 98pp. (1975) [many ref. En]

The full text is given of the following lectures presented at this symposium: Volatiles in foods: the importance of small molecules as reactants in flavour formation, by M. E. Mason (pp. 1-31, 11 ref.); Texturogens in foods, by P. Sherman (pp. 33-45, 21 ref.); Analytical techniques in the food industry for characterizing flavour and texture

stimuli, by D. Reymond (pp. 47-69, 43 ref.); and Soluble and insoluble nonvolatiles in food, by J. Solms (pp. 71-98, 66 ref.). AJDW

139

Unconventional proteins as aroma precursors. Chemical analysis of the volatile compounds in unheated and heated rapeseed protein model systems.

Qvist, I. H.; Sydow, E. C. F. von

Journal of Agricultural and Food Chemistry 24 (3) 437-442 (1976) [29 ref. En] [Swedish Inst. for Food Preservation Res. (SIK), Fack, S-400 21 Göteborg 16, Sweden]

Model samples containing rapeseed protein were analysed by gas chromatography and MS. The headspace of samples, unheated and heated, with or without addition of fat and starch, was investigated. >100 compounds were identified, representing aliphatic hydrocarbons, alcohols, aldehydes, ketones, nitriles, and furan derivatives, and S-containing compounds. Determinations were made of the absolute concn. in the headspace gas of about 70 of the compounds judged to be of potential interest from the point of view of aroma. On heating of the samples, the concn. of volatiles generally increased and new compounds were detected. Of importance for the aroma of the heated samples is the presence of aliphatic aldehydes, S compounds, furans, and probably also N-containing compounds. [See also FSTA (1975) 7 6A306.] AS

140

[Study of the aromatic fraction of orange juice. I. Analytical technique.]

Lafuente, B.; Benedito, J.; Mansanet, A.; Nadal, M. I.

Revista de Agroquímica y Tecnología de Alimentos 16 (1) 89-97 (1976) [27 ref. Es, de, en, fr] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

A technique is described for separating the aromatic fraction of orange juice by flash distillation, followed by quantitative detn. of the components by GLC. The separation is achieved by evaporating 45% of the juice under reduced pressure (<0.5 mm Hg) in a single pass at high speed (80 ml/min) in equipment specially designed to minimize heat damage. Results from an aqueous aroma essence and an orange juice showed satisfactory reproducibility: coeff. of variation (5 replicates) were 2.3 and 2.9% for linalool, 4.8 and 5.6% for citral (geranial + neral) and 5.9 and 6.3% for limonene. AS

141

[Process for the separation of alcohols and volatile essences of products in mixtures obtained by fermentation.]

Deglon, B. H.

Swiss Patent 564 603 (1975) [Fr]

Alcohols and volatile essences of fermentation

products from mixtures which have been obtained from fruit, grain or roots but excluding malt, are separated by distillation under reduced pressure and fractional condensation (5° to -30°C) of the vaporised products. The fermentation product is pre-heated to 10-50°C and introduced into the distillation apparatus. The process is particularly suitable for the manufacture of a wine based drink with a reduced alcohol content e.g. 2-2½%. Distillation is carried out at approx. 20°C and air enriched with O₂ is introduced into the apparatus to produce an ageing of the essences which prevents them undergoing oxidation in the drink. W&Co

142

Identification of vacuum steam-distilled aroma compounds in the press juice of arctic bramble, *Rubus arcticus* L.

Kallio, H.

Journal of Food Science 41 (3) 555-562 (1976) [43 ref. En] [Tech. Res. Cent. of Finland, Lab. for Food Res. & Tech., Otaniemi, Finland]

More than 60 of >200 components were identified by means of glass capillary gas chromatography-MS systems. The total amount of the aroma compounds identified in the press juice was 70-80 ppm. The main aroma component was 2,5-dimethyl-4-methoxy-2,3-dihydro-3-furanone. Smaller amounts of 2,5-dimethyl-4-hydroxy-2,3-dihydro-3-furanone were also found in the juice. The compounds identified, which cover about 90% of the total aroma concentrate, included 11 aliphatic alcohols, 8 aliphatic acids, 8 aliphatic esters, 12 aromatic compounds, 9 non-aromatic terpenes, 9 aliphatic carbonyls (including acetoin, diacetyl and diacetone alcohol), 2 lactones and 1 N-containing compound, ethyl nicotinate. The most abundant compounds in the press juice were 2,5-dimethyl-4-methoxy-2,3-dihydro-3-furanone, acetoin, acetaldehyde, 2-heptanol, a pentenol (evidently trans-3-penten-1-ol), acetic acid, ethyl acetate, ethanol, linalool, 3-methyl-2-buten-1-ol and cis-3-hexen-1-ol. All these compounds exceeded 1 ppm in fresh press juice. The aroma composition of cultivated berries was compared with that of wild berries. IFT

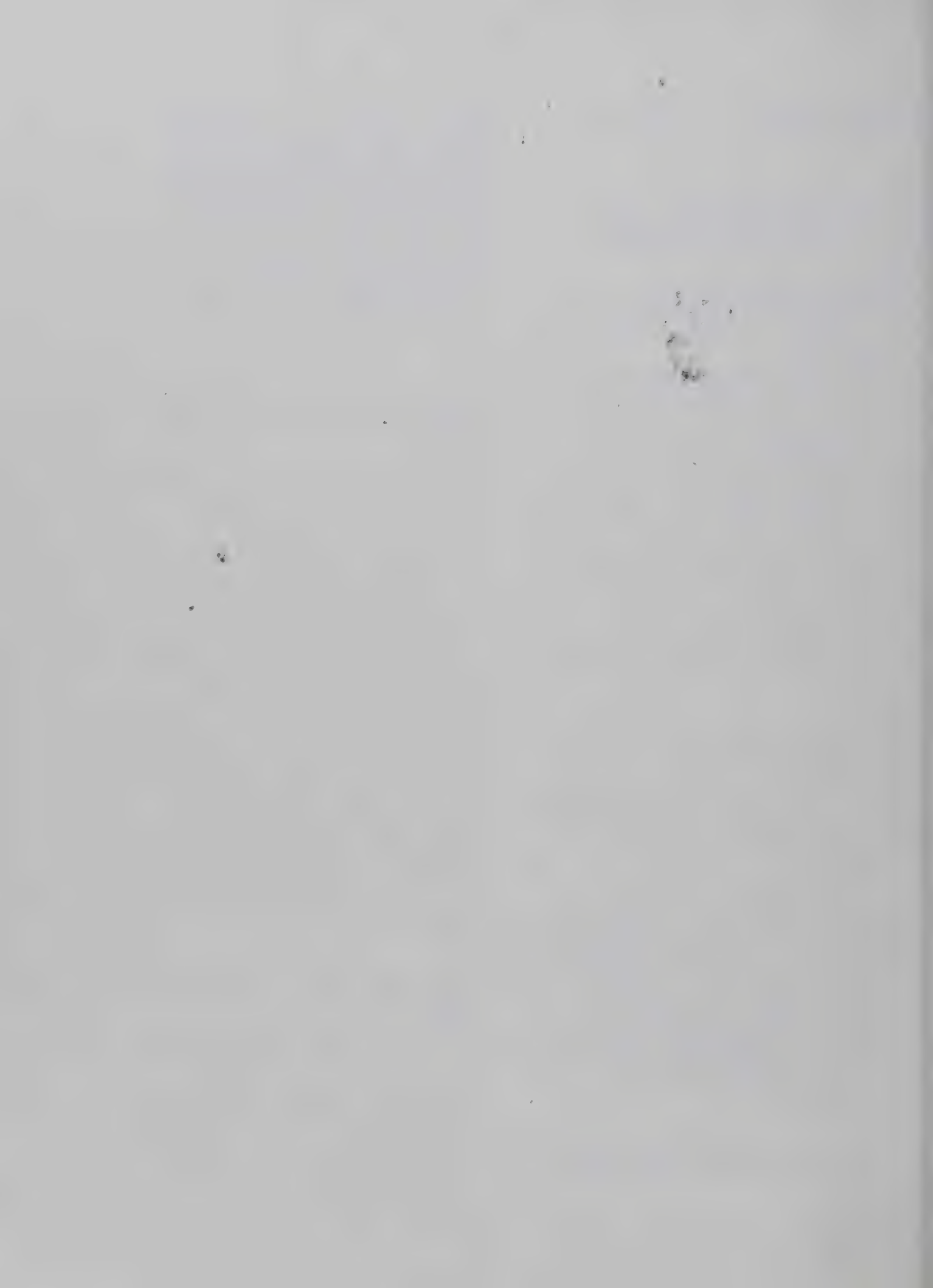
143

Development of volatile aroma compounds in arctic bramble, *Rubus arcticus* L.

Kallio, H.

Journal of Food Science 41 (3) 563-566 (1976) [9 ref. En] [Tech. Res. Cent. of Finland, Lab. for Food Res. & Tech., Otaniemi, Finland]

The formation of volatile aroma compounds of arctic bramble was studied during ripening in the field. The amount of 2,5-dimethyl-4-methoxy-2,3-dihydro-3-furanone, which is the most important aroma compound of the berry, increased from 0.2 to >20% of the volatiles. The total content of alcohols, acids and esters varied between 35 and 66%. The acids studied, acetic, 3-methyl-2-butenic,



2-methylpropanoic, 3-methylbutanoic and 3-methyl-3-butenic, increased to approx. 5% (total) during ripening. The relative amounts of 2-heptanol, benzyl alcohol, cis-3-hexen-1-ol, 2-phenyl-ethanol, 1-butanol and 1-hexanol decreased from unripe to over-ripe samples, whereas trans-3-penten-1-ol, 3-methyl-2-buten-1-ol, linalool, ethanol, α -terpineol and geraniol increased up to the ripe stage and began to decrease after that. The esters, ethyl acetate, methyl pyruvate, 2-methyl-2-butenyl acetate, benzyl acetate and cis-3-hexanyl acetate followed mainly the same pattern as the alcohols mentioned last. The 3 carbonyl compounds measured were acetone, 2-heptanone and 2-methyl-2-butenal, of which the last mentioned showed an extremely rapid increase during ripening. The content of acetoin increased drastically during ripening. IFT

144

Comparison between cold-pressed and distilled lime oils through the application of gas chromatography and mass spectrometry.

Azzouz, M. A.; Reineccius, G. A.; Moshonas, M. G.

Journal of Food Science 41 (2) 324-328 (1976) [21 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St. Paul, Minnesota 55108, USA]

31 volatile components representing 98.2% of the volatile fraction of Mexican cold-pressed lime oil and 37 components representing 91.2% of the volatile constituents of distilled Mexican lime oils were identified. 41 compounds were identified including 14 alcohols, 3 aldehydes, 2 esters, an aliphatic hydrocarbon, 11 monoterpenes, 8 sesquiterpenes, and 2 oxides. The unidentified components are present in trace quantities.

Comparison of GLC chromatograms of cold-pressed and distilled Mexican and West Indian lime oils showed that α -pinene, β -pinene, myrcene and γ -terpinene were present in lesser amounts in distilled oil than in cold-pressed oil. The sesquiterpene hydrocarbons, β -caryophellene, α -bergamotene, α - and β -humulene, and β -bisabolene, were also found to be present in decreased quantities in distilled oil as compared to cold-pressed oil. While α -thujene, neral, geraniol, decanal, geranyl acetate, neryl acetate, and α - and β -clemene were present in cold-pressed oil, they were almost absent from distilled oil. There was an increase in concn. of camphene, d-limonene, terpinolene and terpinene-4-ol in distilled oil. Compounds which apparently were formed during distillation were identified as α -phenyllandrene, 1,4-cineole, p-cymene, α -fenchyl alcohol, and α - and β -terpineol. 6 compounds which have not been previously reported in lime oil were identified as n-nonane, α -thujene, α -phellandrene, α -fenchyl alcohol, β -clemene and guaiane. IFT

145

Studies on the volatile compounds in mushrooms. Pyysalo, H.

Publication, Technical Research Centre of Finland, Materials and Processing Technology No. 13, 14pp. (1975) [20 ref. En] [Food Res. Lab., Tech.

Res. Cent. of Finland, Helsinki, Finland]

Using combined GLC-MS, an average of 50 volatile compounds were identified in each of 7 fresh mushrooms (*Cantharellus cibarius*, *Gyromitra esculenta*, *Boletus edulis*, *Lactarius trivialis*, *L. rufus*, *L. torminosus* and *Agaricus bisporus*). The relative concn. of the main aroma compounds were determined and their contribution to mushroom aroma is discussed. The mushrooms studied were rich in carbonyl compounds and in alcohols having 8 C atoms. The main volatile component in wild mushrooms was 1-octen-3-ol, and in cultivated *Agaricus bisporus* benzyl alcohol. In order to determine the amount of the toxic acetaldehyde N-methyl-N-formyl hydrazone (gyromitrin) in processed *G. esculenta*, these mushrooms were dried and cooked by common household methods. The amount of material reducing potassium iodate was then measured and calculated as gyromitrin. Among the volatiles of *G. esculenta*, 3 previously unknown toxic compounds were found: pentanal-, 3-methyl-butanal- and hexanal-N-methyl-N-formyl hydrazones. A number of volatile γ - and δ -lactones, common natural aroma compounds, were synthesized and the ^{13}C NMR spectra of monosubstituted γ - and δ -lactones were interpreted. ^{13}C NMR spectroscopy proved to be an effective method of following the polymerization of unstable volatile γ -lactones. AS

146

Identification of volatile compounds in seven edible fresh mushrooms.

Pyysalo, H.

Acta Chemica Scandinavica, B 30 (3) 235-244 (1976) [20 ref. En] [Tech. Res. Cent. of Finland, Food Res. Lab., SF-02150 Espoo 15, Finland]

About 50 volatile compounds were identified in each of 7 edible mushrooms, (i) *Cantharellus cibarius*, (ii) *Gyromitra esculenta*, (iii) *Boletus edulis*, (iv) *Lactarius trivialis*, (v) *Lactarius torminosus*, (vi) *Lactarius rufus*, and (vii) *Agaricus bisporus*. All the mushrooms were rich in alcohols and carbonyl compounds containing 8 C atoms. The main volatile compound in fresh wild mushrooms was 1-octen-3-ol, and in cultivated (vii) it was benzyl alcohol (37%). In (ii), 3 previously unknown toxic compounds were identified; these mushrooms are toxic when fresh and must be cooked or dried before use. The relative concn. of the main aroma compounds were determined for each mushroom and their contribution to aroma is discussed. Relative concn. of the volatile acids in steam distillates of the mushrooms are given, as well as gas chromatograms of the volatile extracts. AL

147

Flavour quality of tomatoes.

Dirinck, P.; Schreyen, L.; Wassenhove, F. van; Schamp, N.

Journal of the Science of Food and Agriculture 27 (6) 499-508 (1976) [18 ref. En] [Fac. of Agric. Sci., Dep. of Organic Chem., State Univ. of Ghent,



Coupure 533, B-900 Ghent, Belgium]

Tomato volatiles present in essential oils obtained by steam distillation-continuous extraction and by head-space condensation were identified and evaluated organoleptically. Flavour quality of different samples of fresh tomatoes, evaluated by a panel, could be related to the occurrence and concn. of n-hexanal, trans-2-hexenal, cis-3-hexen-1-ol, 2-isobutylthiazole and some unidentified compounds in the head-space condensation essential oil. AS

148

Identification of volatiles from extracted commercial tuna oil with a high docosahexaenoic acid content.

Crawford, L.; Kretsch, M. J.; Guadagni, D.

Journal of the Science of Food and Agriculture 27 (6) 531-535 (1976) [13 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

Steam-distilled volatiles from the extracted oil of cooked tuna fish were fractionated and identified by GLC-MS. There were 64 compounds identified in the oxygenated fraction and 62 in the hydrocarbon fraction. The hydrocarbon fraction was found to have an unusually low odour threshold of 5.0 parts/10⁹ (in water) and 3.75 parts/10⁹ when a solvent correction factor was applied. As expected, the odour threshold of the oxygenated fraction was much lower (0.6 parts/10⁹ and 0.51 parts/10⁹ when corrected). AS

149

The production of sulphur compounds in Cheddar cheese and their significance in flavour development.

Manning, D. J.; Chapman, H. R.; Hosking, Z. D. *Journal of Dairy Research* 43 (2) 313-320 (1976) [10 ref. En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9BB, Berks., UK]

A method is described for determining H₂S, methanethiol and dimethyl sulphide in Cheddar-cheese headspace. Cheeses aged 2-12 months were analysed using a gas chromatograph equipped with a photometric detector. These cheeses were presented to a trained flavour panel for the assessment of quality and intensity of Cheddar cheese flavour. An attempt was made to correlate the concn. of S compounds in the headspace with the average flavour scores. Results suggest that the flavour intensity of the cheese is related to the concn. of methanethiol in the head-space. AS

150

Essential oil of mastic gum.

Scrubis, B.; Zabik, M. J.; Markakis, P.

International Flavours and Food Additives 6 (6) 349, 356 (1975) [4 ref. En] [Univ. of Thessaloniki, Greece]

Mastic gum is widely used in the Middle East for flavouring alcoholic beverages. The oil obtained from ground commercial mastic gum was analysed

in a Beckman GC-65 gas chromatograph.

Identification of the oil constituents was based on GC evidence (retention time, peak amplification) and analysis of mass spectra. The yield of oil was 2.4 ml/100 g of mastic gum. Tabulated data show the retention times of standard and mastic oil fractions. Perceptage composition of mastic oil was: α-pinene, 78.902; β-pinene, 2.498; d-limonene, 11.524; β-myrcene 0.886; β-thujone, 0.637; linalool, 1.283; linalyl acetate, 1.081; and thymol, 0.088. VJG

151

Application of an automated head-space procedure for trace analysis by gas chromatography.

Kolb, B.

Journal of Chromatography 122, 553-568 (1976) [21 ref. En] [Bodenseewerk Perkin-Elmer & Co. GmbH, D-7770 Überlingen, Federal Republic of Germany]

Head-space analysis of diketones in beer by automated head-space gas chromatography (HSGC) with an electron-capture detector, and analysis of residual solvents in printed foils used for packaging foods, using a new method called 'discontinuous gas extraction' are given among examples of the use of HSGC. AL

152

Formation of odorous compounds from hydrogen sulphide and 2-butenal.

Badings, H. T.; Maarse, H.; Kleipool, R. J. C.; Tas, A. C.; Neeter, R.; Noever de Brauw, M. C. *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 161 (1) 53-59 (1976) [14 ref. En, de] [Cent. Inst. for Nutr. & Food Res. TNO, Utrechtseweg 48, Zeist, Netherlands]

Since many food products contain unsaturated carbonyl compounds and volatile S compounds, a study was made of: reaction of 2-butenal and H₂S in chloroform using triethylamine as catalyst; reaction between 2-butenal and H₂S using Triton B as catalyst; and reaction of 2-butenal and H₂S in dilute aqueous solutions at different pH values (7 and 4). Gas chromatography, spectral analysis and organoleptic evaluation were used to assess the reactions. Many strongly odorous products were formed in the reactions but it was difficult to establish whether the compounds were primary reaction products or formed as secondary products during analysis; several secondary products were formed during heating in gas chromatographic analysis. It is thought that such secondary products could be formed during processing of foods (e.g. sterilization). A change in the pH dramatically changed the composition of the reaction mixture. Therefore, depending on the pH of a food, different reaction products will be formed which may lead to different odour impressions. JA

153

[Evaluation of the aroma of wines by gas chromatography. I. Experimental method for headspace analysis.] Über die gaschromatographische Duftqualifizierung von Weinen. I. Eine zur Gasphasenanalyse entwickelte Versuchsmethode.

Jobbagy, A.; Hollo, J.

Nahrung 20 (3) 287-294 (1976) [29 ref. De, en, ru] [Inst. für Landwirtschaftlich-Chem. Tech., Tech. Univ., Budapest, Hungary]

A headspace GLC method for analysis of aroma compounds in wines is described. 100 ml wine are placed in a 1000 ml flask (sealed with a rubber septum) and heated for ≥ 30 min in a water bath. Headspace gas samples are then collected, and analysed by GLC on a Carbowax 1500/Chromosorb W column. This technique was used for headspace analysis of 7 wines (Tokaji aszu, Tokaji edes szamorodni, Tokaji muskotalyos, Tokaji harslevelü, Egri bikaver, Boglari muskotaly, Debroy harslevelü); tables of peak areas for various fractions are given. Differences between wines were considerably greater than the scatter of results for single wines. AJDW

154

[Evaluation of the aroma of wines by gas chromatography. II. Determination of an index-number defining bouquet quality; its relationship with gas chromatographic peak areas and conditions of application.] Über die gaschromatographische Duftqualifizierung von Weinen. II. Entwicklung einer Messzahl zur Qualifizierung des Duftes durch Bestimmung seines Zusammenhanges mit den Peakflächen und Bedingungen ihrer Anwendung.

Jobbagy, A.; Hollo, J.

Nahrung 20 (3) 295-305 (1976) [3 ref. De, en, ru] [Inst. für Landwirtschaftlich-Chem., Tech., Tech. Univ., Budapest, Hungary]

The headspace-GLC method described in the preceding paper was used in development of a method for evaluation of wine quality on the basis of GLC peak areas of 6 aroma fractions (acetaldehyde, ethyl formate, ethyl acetate, n-propanol + n-butyl acetate, isobutanol + isoamyl acetate, and isoamyl alcohol). Quality tends to improve with increasing concn. of fractions eluted before ethanol (the first 3 fractions listed above). An equation is given for evaluation of wine aroma quality on the basis of peak areas of the 6 fractions studied in the wine under test, relative to peak areas in Tokaji edes szamorodni (used as a standard). The accuracy of the method is discussed. AJDW

155

[Study of bouquet formation in brandy.]

Lichev, V.

Lozarstvo i Vinarstvo 25 (1) 26-36 (1976) [26 ref. Bg]

A detailed discussion of the qualitative and

quantitative content of substances forming the aroma complex in French and Bulgarian brandies and cognacs (Pliska, Preslav, Sl'nchev Bryag, Martell, Napoleon) is given; extracted and condensed aroma substances were studied by gas chromatography. Pliska and Sl'nchev Bryag were found to be high in acetate esters. During maturation, generally there was a rapid drop in readily volatile esters, and high-boiling esters participated in the formation of flavour and aroma (ethyl laurate, ethyl capronate). Also of importance were aldehydes, producing the vanilla flavour, terpenes and octolactones. Higher alcohols were significant mainly in young brandies and cognacs. STI

156

Steam volatile aroma constituents of roasted coffee: neutral fraction.

Vitzthum, O. G.; Werkhoff, P.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 160 (3) 277-291 (1976) [52 ref. En, de] [Wissenschaftliche Abteilung, HAG AG, Hagstrasse, D-2800 Bremen, Federal Republic of Germany]

The volatile components of roasted coffee, isolated by normal-pressure steam distillation, were separated into basic and neutral fractions. The neutral fraction was analysed on a UCON HB 5100 glass capillary column (200 m \times 0.31 mm inner diam.) coupled to a low-resolution mass spectrometer. 120 compounds were identified, of which 26 had not been previously reported in coffee aroma. Identification of the structures of the newly identified compounds was accomplished by comparison of their mass spectra with reference spectra. GLC retention times were used to confirm identifications. The new compounds identified for the first time in roasted coffee include 15 furans, 6 pyrroles, 3 thiophenes, and 2 ketones. Of the 15 furans, several methylvinylfurans, dimethylvinylfurans and alkenylfurans, which had not been previously found in roasted foodstuffs, are of particular interest. MS data of the newly identified substances are tabulated. Fragmentation patterns of N-acetyl-2-methylpyrrole, N-furfuryl-2-methylpyrrole, 2-vinyl-3-methylfuran and 2-vinyl-3,5-dimethylfuran are discussed. Comments are made on possible formation patterns and precursors in green coffee beans. [See also FSTA (1975) 7 11H1682.] AS

157

[Gas chromatographic determination of constituents of fermented beverages. VII.

Determination of dimethyl sulphide and dimethyl disulphide in beer after 'on-column-enrichment' of volatile sulphur compounds.]

Gaschromatographische Bestimmung der Inhaltsstoffe von Gärungsgetränken. VII. Bestimmung von Dimethylsulfid und Dimethyldisulfid in Bier nach 'on-column-enrichment' leichtflüchtiger Schwefelverbindungen.

Schreier, P.; Drawert, F.; Junker, A.
Chemie Mikrobiologie Technologie der Lebensmittel 4 (6) 189-193 (1976) [22 ref. De, en, fr] [Inst. für Lebensmitteltech. & Analytische Chemie, Tech. Univ., Munich, Federal Republic of Germany]

The volatile S compounds in beer were enriched by sweeping in a N₂ flow and subsequent condensation on a small section of the front part of the cooled gas chromatographic column ('on-column-enrichment'). Specific detection with a flame photometric detector led to qualitative identification of 12 components. Quantitative determination in 44 bottom and top fermented beers showed quantities of dimethyl sulphide in the range 20-115 µg/l. (average 61 µg/l.). The concn. of dimethyl disulphide was in the range 0.8-3.7 µg/l. (average 1.5 µg/l.). There was no evidence of any characteristic differences between the beer types. [See FSTA (1975) 7 9H1388 for part IV.] AS

158

[Gas chromatographic determination of diacetyl, acetoin, and 2,3-pentanedione in wine.]

Gaschromatographische Bestimmung von Diacetyl, Acetoin und 2,3-Pentandion in Wein.

Postel, W.; Güvenc, U.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 161 (1) 35-44 (1976) [27 ref. De, en] [Inst. für Lebensmitteltech. und Analytische Chemie, Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

The method, which is described in detail, consists of 2 phases. In the first, diacetyl and 2,3-pentanedione are driven off with gaseous N₂ at 60°C, collected in ice-cooled methanol, and directly injected into a gas chromatograph which employs an electron capture detector to selectively indicate the vicinal diketones. The second phase, which is carried out on another sample, involves oxidation of acetoin to diacetyl, determination of the diacetyl content before and after oxidation, and calculation of acetoin content from this data. The method was applied to 57 German white wines of the 1970, 1971 and 1972 vintages and to 20 red wines from various European countries. Ranges and mean values (mg/l.) found for the white and red wines, respectively, were: diacetyl, 0.08-3.40, 0.42 and 0.26-4.06, 1.46; 2,3-pentanedione, 0.02-0.36, 0.10 and 0.08-0.88, 0.25; acetoin 1.9-31.7, 5.9 and 5.9-38.2, 15.0. JA

159

[Effect of trace elements on some volatile components of grapes and wine.] (In 'Problems of the Biochemistry of Grapes and Wine' [see FSTA (1976) 8 11H1906].) [Lecture]

Gadzhiev, D. M.; Izmailova, M. M.
pp. 101-104 (1975) [Ru] [Dagestanskii Inst. Pishchevoi Promyshlennosti, USSR]

The effect of trace elements on volatile substances formation in grapes and wine was

studied. When Mn, Zn, Co, Mo and B were added to the soil around the vine roots, not only did the trace elements contents of the grapes vary but there were also changes in other constituents, particularly the volatile compounds. This was borne out by addition of trace elements to the must prior to fermentation. The organoleptic properties of white table wine made from the grapes or must were to some extent correlated with the contents of iso-amyl acetate, ethyl lactate, diethyl succinate, ethyl capronate, iso-amyl caprylate and β-phenylethanol. High contents of n-pentanol, 2-methyl-1-butanol, methyl acetate and ethyl formate had a favourable effect on the flavour and aroma of red table wine of the Cabernet type. STI

160

[Formation of aroma compounds during alcoholic fermentation of grape must.] *Dynamik der Bildung von Aromastoffen während der alkoholischen Gärung von Traubenmost.*

Goranow [Goranov], N.

Mitteilungen: Rebe, Wein, Obstbau und Früchteverwertung 26 (1) 5-12 (1976) [14 ref. De, en, fr] [Inst. für die Weinind., Sofia, Bulgaria]

During 3 consecutive yr, commercial red-wine and white-wine musts were sulphited at 15 g SO₂/hl and fermented with 2% pure culture of Gamza 19 yeast and of Epernay yeast, respectively. Initially and at 24-h intervals, highly volatile products were extracted using pure N₂ and condensed at -80°C, and less volatile produces were extracted with n-pentane. The 2 fractions of volatiles were examined by TLC. Chromatograms are presented for the 1st, 2nd, 3rd, 4th, 5th and 9th days of fermentation. It is concluded from interpretation of the peaks that formation of isoamyl and n-propyl alcohols proceeds rapidly at the beginning of fermentation; that formation of isobutyl alcohols and hexanols begins only after 30% of the sugar has been degraded; and that intensity of aroma formation is highest after 50-60% of the sugar has been degraded. SKK

161

[Determination of volatile components in wine spirits and brandies.] (In 'Problems of the Biochemistry of Grapes and Wine' [see FSTA (1976) 8 11H1906].) [Lecture]

Khiabakhov, T. S.
pp. 400-404 (1975) [1 ref. Ru] [Vses. Nauchno-issled. Inst. Vinodeliya i Vinogradarstva, USSR]

The contents of volatile constituents in wine spirits and brandy were determined by extraction and gas chromatography; neither proved satisfactory. A new method is therefore proposed, involving gas chromatography with the direct introduction of the sample into the evaporator of the apparatus; the procedure used is described. The method is said to be less demanding on time, labour and material, to be simple and very accurate. Constituents in quantities >1 mg/100 ml can be determined quantitatively with a relative error of <5%. The method may be used as a rapid means for

Qualitative and quantitative detn. of volatile constituents in wine spirits, brandies and various fractions obtained by distillation of wine or crude alcohol. STI

62

Do-it-yourself strawberry.

Roderick, J. J.

International Flavours and Food Additives 7 (2) 1-52 (1976) [23 ref. En] [Flavour Div., H. Johnston & Co. Inc., New York, NY, USA]

This article emphasizes that productive flavour research requires cooperation between the flavour researcher and the flavourist. It offers guidance to the flavourist in creating his own strawberry flavour. Consideration is given to preliminary work, method of obtaining an extract, and analysis of the extract. A table lists: components in strawberry identified by research prior to 1952 (14); components unidentified in strawberries but used by flavourists (8); and components identified in strawberries to date (30 alcohols, 32 acids, 26 carbonyl compounds, 68 esters and 26 others). JG

163

Vanillin in butter concentrate. Characterization and determination.]

Sourcelles, C.; Carbonel, F.; Dupont, A.; Doorn, van

Annales des Falsifications et de l'Expertise Chimique 69 (740) 411-424 (1976) [7 ref. Fr] Lab. Cent. du Service de la Repression des Fraudes, 25 Avenue de la Republique, 91305 Massy, France]

A hexane solution of the butter sample was extracted with warm water to remove aromatic constituents. The vanillin content of the aqueous extract was determined from the absorption at 348 nm. The presence of natural vanilla constituents was established by TLC of an ether extract of the aqueous solution. A silica gel plate was used with chloroform:isopropanol (100:7) as solvent. Synthetic vanillin, the aromatic constituents of vanilla and its contaminants showed as violet spots under UV light (254 nm). Further characterization was obtained by spraying with hydrazine sulphate p-hydroxybenzaldehyde, anisaldehyde, vanillin, ethylvanillin and piperonal appeared as yellow spots in natural light, and p-hydroxybenzaldehyde gave a yellow/green spot and anisaldehyde a blue spot under UV light at 366 nm). Coumarin was identified by the turquoise blue colour obtained after spraying with 5% alcoholic KOH; p-hydroxybenzylalcohol and anise alcohol gave a pink colour and vanillic alcohol a grey colour after spraying with conc. H₂SO₄. MEG

164

Aroma research. Proceedings of the International Symposium on Aroma Research held at the Central Institute for Nutrition and Food Research TNO, Zeist, the Netherlands, May 26-29, 1975.

[Conference proceedings]

Maarse, H.; Groenen, P. J. (Netherlands, Organization for Nutrition & Food Research TNO; Netherlands, Central Institute for Nutrition & Food Research TNO) (Editors)

245pp. ISBN 90-220-0573-9 (1975) [many ref.

En] Wageningen, Netherlands; Centre for Agricultural Publishing & Documentation Price f55

This book, which consists of the papers and short communications presented at the symposium, is divided into the following 4 sections, each section containing several papers: Formation of aroma compounds in foods (pp. 11-100); Relation between instrumental and sensorial analysis (pp. 101-140); Factors governing the emanation of volatile compounds from an odorous substrate (pp. 141-194); and The future of aroma research (pp. 195-243). Individual papers and short contributions are: Biochemical formation of aroma components, by F. Drawert (pp. 13-39, 29 ref.), which is largely a review but also discusses recent studies of the biosynthesis of bitter substances in hops; Biogenesis of volatiles in fruit and vegetables, by R. Tressl, M. Holzer & M. Apetz (pp. 41-62, 60 ref.); Formation of odorous compounds from hydrogen sulphide and methanethiol and unsaturated carbonyls, by H. T. Badings, H. Maarse, R. J. C. Kleipool, A. C. Tas, R. Neeter & M. C. ten Noever de Brauw (pp. 63-73, 16 ref.), which reports experimental work on model systems, particularly studies of the reaction between H₂S and 2-alkenals; Aroma compounds formed by enzymic co-oxidation, by W. Grosch, G. Laskawy & K.-H. Fischer (pp. 75-83, 18 ref.), which reports on model studies of co-oxidation by lipoxygenases and of the volatile compounds (mainly carbonyl compounds) formed; Analysis of off-flavours in food, by J. M. H. Bemelmans & M. C. ten Noever de Brauw (pp. 85-93, 22 ref.), which reviews the subject and presents as an example the identification of chloroanisoles in a chicken feed suspected of causing musty taint in eggs; [continued in following abstr.] JA

165

Aroma research. Proceedings of the International Symposium on Aroma Research held at the Central Institute for Nutrition and Food Research TNO, Zeist, the Netherlands, May 26-29, 1975.

[Conference proceedings]

Maarse, H.; Groenen, P. J. (Netherlands, Organization for Nutrition & Food Research TNO; Netherlands, Central Institute for Nutrition & Food Research TNO) (Editors)

245pp. ISBN 90-220-0573-0 (1975) [many ref.

En] Wageningen, Netherlands; Centre for Agricultural Publishing & Documentation Price f55

[Continued from preceding abstr.] Organic sulphur compounds as flavour constituents: reaction product of carbonyl compounds, hydrogen sulphide and ammonia, by H. Boelens, L. M. van der Linde, P. J. de Valois, J. M. van Dort & H. J. Takken (pp. 95-100, 15 ref.), which reports on studies by gas chromatography and MS of reaction products from model systems; The human instrument in sensory analysis, by E. P. Köster (pp. 103-110); Aroma

values - a useful concept?, by M. Rothe (pp. 111-119, 12 ref.); Use of odour thresholds in sensorial testing and comparisons with instrumental analysis, by P. Salo (pp. 121-130, 15 ref.), which reviews studies on whisky; Techniques for assessing odour: uses and limitations, by D. G. Land (pp. 131-138, 12 ref.), the techniques discussed being semantic differential, free description, flavour profile and directed description with rating; Thiamine, thiamine diphosphate and 'aroma values', by J. Wolms (pp. 139-140, 3 ref.) [see FSTA (1976) 8 G177 & 3G178]; Binding of volatile aroma substances to nutrients and foodstuffs, by H. G. Maier (pp. 143-157, 5 ref.), which discusses binding of the substances by amino acids, triglycerides, proteins, carbohydrates, and dry foodstuffs (milk powder, potato flakes, coffee extract, strawberry powder); Method for encapsulation of polar compounds in foods, by H. G. Peer & B. Hoogstad (pp. 159-166, 11 ref.), which discusses preparation of the capsules, their physical structure, measurement of their flavour retention and potential uses, e.g. in soup; [continued in following abstr.] JA

166

Aroma research. Proceedings of the International Symposium on Aroma Research held at the Central Institute for Nutrition and Food Research TNO, Zeist, the Netherlands, May 26-29, 1975. [Conference proceedings] Maarse, H.; Groenen, P. J. (Netherlands, Organization for Nutrition & Food Research TNO; Netherlands, Central Institute for Nutrition & Food Research TNO) (Editors) 245pp. ISBN 90-220-0573-9 (1975) [many ref. En] Wageningen, Netherlands: Centre for Agricultural Publishing & Documentation Price f55. [Continued from preceding abstr.] The effect of process conditions on aroma retention in drying liquid foods, by P. J. A. M. Kerkhof & H. A. C. Thijssen (pp. 167-192, 69 ref.); Reaction of vanillin with albumin, by J. H. Dhont (pp. 193-194); British and international legislative control of flavouring substances in food, by T. J. Coomes (pp. 197-202, 10 ref.); The future of aroma research, by F. Rijkens & H. Boelens (pp. 203-220, 42 ref.); Heterocyclics in flavour chemistry: five- and six-membered rings containing oxygen, nitrogen and sulphur atoms; monocyclic and condensed bicyclic components, by I. Flament (pp. 221-237, 81 ref.); Aromatization and international legislation, by H. van den Dool (pp. 239-242); and Wide-bore glass capillary columns in gas chromatography of aroma components, by H. T. Badings (p. 243). JA

167

Aroma values - a useful concept?

Rothe, M.
Nahrung 20 (3) 259-266 (1976) [12 ref. En, de, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]
The concept of 'aroma value' (the actual concn. of an aroma compound divided by its threshold concn.) of food aroma constituents is discussed,

with reference to its possible value for identification of the compounds principally responsible for the individual aroma of foods. Limitations of the concept include lack of consideration of sensory/physiological factors (e.g. synergism or antagonism between aromas, and non-linear relation of apparent aroma intensity to aroma concn.) and problems of detn. of odour threshold values (variations due to test method, diluent used, etc.). IN

168

Reaction of hydrogen sulphide with 2-alkenals.

Kleipool, R. J. C.; Tas, A. C.; Maarse, H.; Neeter, R.; Badings, H. T.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 161 (3) 231-238 (1976) [8 ref. En, de] [Cent. Inst. for Nutr. & Food Res. (CIVO) TNO, Zeist, Netherlands]

In connection with a research programme investigating the formation of aroma components during the preparation or storage of food products, the reaction of H_2S with 2-alkenals was studied. Depending on the types of solvent and catalyst, different products are formed on reaction of H_2S with 2-alkenals. The structure of some of these products have been elucidated, and reaction sequences leading to them are proposed. AS

169

[Determination of acetic acid, propionic acid and other volatile organic acids in bakery products and in other foods.]

Chioffi, V.; Stefani, B.

Industria Alimentari 15 (6) 74-78 (1976) [5 ref. It] [Lab. Chimico Provinciale, Rovigo, Italy]

A procedure for detn. of volatile organic acids in foods is described. Samples are acidified with phosphoric acid, and the volatile acids are separated by steam distillation. The distillate is then neutralized with NaOH, and evaporated to dryness; the dry residue is dissolved in a small quantity of pyridine-2,4-dicarboxylic acid, and analysed by GLC on Porapak Q using a flame ionization detector. Mean recoveries for acetic, propionic and butyric acids were 99.85, 99.92 and 101.63% respectively. Data are given for acetic and propionic acid concn. in samples of 13 bakery products, and acetic acid concn. in 9 other foods.

AJDW

170

[Gas chromatographic-mass spectrometric investigation of the volatile components of wines.

VI. Aroma compounds of Tokay aszu wines. (a).

Neutral compounds.] Gaschromatographisch-massenspektrometrische Untersuchung flüchtiger Inhaltsstoffe des Weines. VI. Aromastoffe in Tokajer Trockenbeerenauslese (Aszu)-Weinen. (a). Neutralstoffe.

Schreier, P.; Drawert, F.; Kerenyi, Z.; Junker, A.
Zeitschrift für Lebensmittel-Untersuchung und -Forschung 161 (3) 249-258 (1976) [28 ref. De,

en] [Inst. für Lebensmitteltech. & Analytische Chemie, Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

The aroma compounds of Tokay aszu wines were enriched by liquid-liquid extraction (pentane-methylene chloride, 2 + 1) and compared with the aroma substances of a magyar Furmint wine. After separation of acids and fractionation of aroma extracts on silica gel, 119 aroma components were identified in the neutral fractions by means of gas chromatography-MS. Relatively high concn. of furfural, 5-methylfurfural, acetoin, various acetals, and ethyl esters of keto, hydroxy and dicarbonic acids and the lack of terpenic compounds are characteristic of aszu wines. Quantitative differences depending on vintage and storage conditions were found; the acetal concn. is related to the age of the wine. [See FSTA (1975) 7 5H701 for part V.] AS

171

[Chemical character of substances forming the bouquet of champagne.]

Rodopulo, A. K.; Egorov, I. A.; Kormakova, T. A.; Bezzubov, A. A.

Vinodelie i Vinogradarstvo SSSR No. 8, 14-18 (1975) [Ru] [Ordena Lenina Inst. Biokhimii im. A. N. Bakha AN SSSR, USSR]

9 samples of champagne varying in quality were studied. Aroma substances were extracted by 1:1 pentane-ether and analysed by gas chromatography with programmed temp. 69 components of the bouquet of champagne wines were identified and included aliphatic alcohols to C₉, terpene alcohols, esters of aliphatic acids, and carbonyl compounds. Total content of aroma substances was 366-732 mg/l. Principal effects of the groups of compounds on bouquet of wine are described. It is stated that wine quality is higher with increasing contents of esters of high bp and smaller contents of low bp esters. STI

172

[New aroma recovery and evaporation plant for fruit pulp in Merano.] Neue Aromarückgewinnungs- und Eindampfanlage für Fruchtmarm in Meran.

Anon.

Flüssiges Obst 43 (5) 162-163 (1976) [De]

The 'Unipektin' AFV 553 3-stage falling film concentrator with coupled aroma recovery for fruit pulp (manufactured by H. Zipperle, Merano, Italy) is described and diagrammatically illustrated. Technical operation data are tabulated for throughputs/h of 8000 kg pulp for apricots or peaches, 8000 kg pulp for tomatoes, 12 000 kg juice for grapes, and 6450 kg for citrus juice. Initial and final DM contents respectively were in the order stated above (%): 11 and 24, 5.5 and 18, 20 and 47, and 11 and 65. Aroma recoveries were, in the same order (excluding tomatoes): 80, 120 and 65 l/h (in 100-fold concn.). SKK

173

Determination of polycyclic aromatic hydrocarbons: technique and application to coffee oils.

Bracco, U.

Nestle Research News 1974/75, 83-93 (1976) [26 ref. En]

See FSTA (1974) 6 7H1106 for Fr text.

174

[Studies on soong-neung flavour. II. Identification of some volatile pyrazine and carbonyl compounds in soong-neung (extract of cooked and roasted rice).]

Cheigh, H.-S.; Nam, J.-H.; Kim, T.-J.; Kwon, T.-W.

Korean Journal of Food Science and Technology 7 (1) 15-21 (1975) [34 ref. Ko, en] [Food Resources Lab., Korea Inst. of Sci. & Tech., Seoul, S. Korea]

Soong-neung, a traditional Korean beverage served after meals, is made from cooked and roasted rice produced on the bottom of a container during rice cooking. The volatiles from an extract of cooked and roasted rice were separated into pyrazine and carbonyl fractions and qualitatively investigated. The pyrazine fraction was characterized by GLC and GLC-MS and 5 pyrazines were positively identified. Pyrazine compounds identified were 2-methylpyrazine, 2,3-dimethylpyrazine, 2,5-dimethylpyrazine, 2-ethyl-5-methylpyrazine and 2-ethyl-3-methylpyrazine. Carbonyls were converted to their 2,4-dinitrophenylhydrazones and identified by GLC, GLC-MS and TLC. Acetaldehyde, propionaldehyde, iso-butyraldehyde and iso-valeraldehyde were positively identified in the carbonyl compounds. The aroma of the fractions identified as 2,3-dimethylpyrazine and 2,5-dimethylpyrazine had a nut-like or roasted cereal-like character characteristic of soong-neung. [See FSTA (1975) 7 3M331 for part I.] AS

175

[Flavour components of whisky and brandy.]

[Review]

Yoshizawa, K.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 70 (12) 872-879 (1975) [55 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

Aspects covered in this review of flavour components of whisky and brandy include: alcohols, acids, esters, carbonyl compounds, phenolic compounds, and N compounds. YN

176

[Dynamics of volatile compound formation during preparation of raw stocks for wine distillates.]

Khiabakhov, T. S.; Nechaev, L. N.

Vinodelie i Vinogradarstvo SSSR No. 7, 26-29 (1975) [1 ref. Ru] [Vserossiiskii Nauchno-issled.

ist. Vinogradarstva i Vinomaterialov, USSR]
The dynamics of formation of volatile constituents in wine musts during storage, alcoholic fermentation and malo-lactic fermentation are discussed; possible methods for control of formation of individual compounds are considered. Compounds formed in large quantities during fermentation include methanol, n-propanol, isobutanol, methyl-2-butanol-1, methyl-3-butanol-1, acetaldehyde, ethyl acetate, isoamyl acetate, ethyl acetate and volatile acids. Application of these results in improving technology of distilling wine production is described. STI

77

Synthesis and flavor evaluation of some alkylthiophenes. Volatile components of onion. Galetto, W. G.; Hoffman, P. G. *Journal of Agricultural and Food Chemistry* 24 (4) 852-854 (1976) [22 ref. En] [Res. & Development Lab., McCormick & Co. Inc., Hunt Valley, Maryland 21031, USA]
Pure samples of 2,4-, 2,5-, and 3,4-dimethylthiophene have been obtained. These compounds, upon organoleptic evaluation, have been determined not to contribute significantly to the flavour of fried onion when examined alone, in combination, or when added to artificial or natural onion oils. These findings are contrary to those previously reported in the literature. Pure samples of 2-methyl- and 3-methylthiophene, as well as 2,3-dimethylthiophene, have also been purified and evaluated organoleptically. AS

178

Synthesis and flavor evaluation of several alkylfuranones found in *Allium* species (onions, shallots, and leeks). Galetto, W. G.; Hoffman, P. G. *Journal of Agricultural and Food Chemistry* 24 (4) 854-856 (1976) [10 ref. En] [Res. & Development Lab., McCormick & Co. Inc., Hunt Valley, Maryland 21031, USA]
Recently, the identification of 2 alkylfuranones (norcepanone and cepanone) in the essential oils of several *Allium* species (onions, shallots, and leeks) has been reported [e.g. FSTA (1974) 6 9J1355]. Their interesting structures and presence in significant quantitative amounts prompted the authors to synthesize and organoleptically evaluate these compounds. Their flavour characteristics are of a fatty-waxy nature, similar to aliphatic aldehydes and alcohols. They do not make a significant contribution to the flavour of the essential oil of onion. AS

179

Additional volatile components of cabbage, broccoli, and cauliflower. Buttery, R. G.; Guadagni, D. G.; Ling, L. C.; Seifert, R. M.; Lipton, W. *Journal of Agricultural and Food Chemistry* 24 (4)

829-832 (1976) [19 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

The vacuum steam volatile oils cooked cabbage, broccoli, and cauliflower were analysed by the combination of capillary gas chromatography and MS. Major components characterized that had not been previously reported in these vegetables included nonanal and octanol in cauliflower and broccoli, 3-methylthiopropyl cyanide in cauliflower and cabbage, and 4-methylthiobutyl cyanide, 2-phenylethyl cyanide, and 2-phenylethyl isothiocyanate in all 3 vegetables. The most unusual compound characterized was $\text{CH}_3\text{SCH}_2\text{SSCH}_3$ [2,4,5-trithiahexane]. Odour thresholds in water solution were determined on the major compounds characterized. AS

180

Volatile flavour components of brazil nuts *Bertholletia excelsa* (Humb. and Bonpl.). Clark, R. G.; Nursten, H. E. *Journal of the Science of Food and Agriculture* 27 (8) 713-720 (1976) [18 ref. En] [Atkin-Thompson Lab., Procter Dep. of Food & Leather Sci., Univ., Leeds LS2 9JT, UK]

Essences were prepared from solvent-extracted brazil nut oil, alternatively by means of a Likens and Nickerson apparatus [Proceedings. American Society of Brewing Chemists (1964) p.5] and a high vacuum degassing unit [based on that described in FSTA (1971) 3 10J1346]. The relatively inexpensive degassing unit and its use are briefly described. 37 components were identified by GLC-MS including most of the major components. The aroma of the components of each essence was evaluated on elution from a GLC capillary column. AS

181

[Mushroom volatiles.] Pyysalo, H. *Kemia-Kemi* 2 (12) 606-609 (1975) [14 ref. Fi, en]

The volatile constituents of 6 common wild Finnish mushrooms are tabulated or shown as gas chromatograms. These are: *Cantharellus cibarius*, *Boletus edulis*, *Gyromitra esculenta*, *Lactarius trivialis*, *L. rufus* and *L. torminosus*. Numerous alcohols and carbonyl compounds with 8 C atoms were found in fresh samples; dried mushrooms are reported to contain numerous pyrazines and pyrroles. [From En summ.] HBr

182

[UV spectrophotometric behaviour of Calabrian bitter orange essential oil produced by evaporation.] [Lecture] Giacomo, A. di; Postorino, E. *Essenze Derivati Agrumari* 45 (3/4) 263-278 (1975) [15 ref. It] [Sta. Sperimentale per l'Ind. delle Essenze e dei Derivati degli Agrumi, Reggio Calabria, Italy]

46 samples of bitter orange essential oil, reduced by evaporation from extracted peel by (i) single centrifugation following calcitation or (ii) double centrifugation (without calcitation) were examined by UV spectrophotometry and results tabulated. Process (ii) reduced the concn. of spectrophotometrically active components, without affecting the olfactory properties of the essential oil. The simultaneous reduction in non-volatile components could possibly remove some protective (antioxidant) compounds. The aldehyde contents were 0.67-0.98%. RM

183

Spectrofluorometric determination of coumarin in bergamot essential oil. [Lecture] Calabrio, G.; Curro, P.

Essenze Derivati Agrumari 45 (3/4) 246-262 (1975) [14 ref. It] [Istituto di Merceologia dell'Univ. di Messina, Messina, Italy]

A quick and simple method is described for detn. of coumarin in bergamot essential oil. It employs separation of the components by TLC on silica gel 254 (Merck) and direct measurement on the chromatoplate of the emission fluorescence for detn. of citrioptene and 7-methoxy-5-geranoxycoumarin, and the reduction in fluorescence of the indicator for detn. of bergaptene and bergamotene. UV spectra of the 4 components, emission profiles at 330-490 nm, fluorescence reduction profiles at 272 and 520 nm and standard curves are shown graphically. Analytical results for 14 samples of pure bergamot essential oil were tabulated, showing 0.14-0.24% citrioptene, 0.12-0.15% 7-methoxy-5-geranoxycoumarin, 0.15-0.33% bergaptene and 1.4-2.2% bergamotene. Corresponding values for a synthetic product were 0.03, 0.02, 0.00 and 0.0%. RM

184

[Gas chromatographic-mass spectrometric studies on volatile constituents of molasses.]

Gaschromatographisch-massenspektrometrische Untersuchung flüchtiger Inhaltsstoffe von Melasse. Tressl, R.; Jakob, R.; Kossa, T.; Bronn, W. K. *Branntweinwirtschaft* 116 (8) 117-119 (1976) [18 ref. De] [Lehrstuhl für Chem.-tech. Analyse, Tech. Univ., Berlin (West)]

Volatiles were extracted from beet molasses, fractionated by adsorption chromatography, and identified by GLC-MS. Tables of results are given. 25 N-containing compounds, 14 furans or phenols and 29 aliphatic or aromatic acids were identified, many being reported for the first time in molasses. TUB-IGB

185

2-[(methylthio)methyl]furan: a characteristic aroma compound of white bread.

Mulders, E. J.; Kleipool, R. J. C.; Noever de Brauw, M. C. *ten Chemistry and Industry* No. 14, 613-614 (1976) [9 ref. En] [Cent. Inst. for Nutr. & Food Res.

TNO, Zeist, Netherlands]

Identification of a compound with a strong bread-like odour, isolated from a white bread aroma concentrate, is described. The mass, IR and NMR spectra of the title compound are shown. The bread aroma compound is believed to have an odour threshold concn. of 4×10^{-11} v/v. AL

186

Volatiles of milk products. Extraction and identification.

Moinas, M.

Nestle Research News 1974/75, 54-56 (1976) [2 ref. En]

See FSTA (1974) 6 3P313 for Fr text.

187

[Basic research on manufacturing ethanol-fermented milk beverages. VII. Volatile fatty acids in the various alcohol fermented skim-milks and whey.]

Ochi, T.; Nakanishi, T.

1278ch 24 (4) A151-A154 (1975) [11 ref. Ja, en] [Tohoku Social Welfare Univ., Sendai, Japan]

Saccharomyces sake Yabe IFO 0305 was grown for 10 days at 30°C in the 8 media described in part VI [FSTA (1976) 8 7P1257]. Volatile fatty acid (VFA) production was greater in skim-milk media (66-141 mg/100 ml) than in whey media (39-54 mg/100 ml). The VFA contents of lactic acid fermented media after pepsin digestion of skim-milk or whey respectively were: acetic acid, 39.41 and 43.23; iso-butyric, 8.29 and 0.21; n-butyric, 76.04 and 0.21; iso-valeric, 13.86 and 9.79; n-caproic, 1.87 and 0.43 and n-caprylic, 0.56 and 0.18 mg/100 ml. Production of VFA by *S. sake* appeared to be less than that by *S. fragilis*, *Torulopsis sphaerica* and *Candida pseudotropicalis*. [From En summ.] MEG

188

Study of meat volatiles associated with aroma generated in a D-glucose-hydrogen sulfide-ammonia model system.

Shibamoto, T.; Russell, G. F.

Journal of Agricultural and Food Chemistry 24 (4) 843-846 (1976) [43 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

The volatile compounds produced by heating a model system of D-glucose-hydrogen sulphide-ammonia were entrained on Porapak Q and subsequently desorbed and transferred to a glass capillary column for separation and identification. Gas chromatographic and MS methods were used to identify 34 of the major components. The compounds identified included a thiol, sulphides, thiophenes, thiazoles, and furans. Thiophene and furan derivatives were the major volatile constituents of this reaction mixture which gave roast beef-like aroma. AS

89

olatile flavor components of beef boiled conventionally and by microwave radiation.

MacLeod, G.; Coppock, B. M.

Journal of Agricultural and Food Chemistry **24** (4) 835-843 (1976) [45 ref. En] [Dep. of Food Sci., Nutr., Queen Elizabeth Coll., London W8 7AH, UK]

Using a modified Likens & Nickerson extraction procedure [FSTA (1975) 7 10Q152] followed by low temp./high vacuum distillation, representative samples of aroma volatiles were obtained from beef, both while boiling by microwave radiation and by conventional means. Separation of the components of the isolates was achieved by gas chromatography and the majority of the components identified using combined gas chromatography-MS. Odour assessments were made of the separated volatile components. A comparative study was undertaken of the effect on the volatile components of boiling for different periods of time conventionally and by microwave heating. AS

190

[Investigations into aroma compounds of seasonings treated with liquid smoke.]

Untersuchungen über Aromastoffe bei mit Dampfrauch geräuchertem Gewürz.

Keller, G.; Günther, H. O.

Fleischwirtschaft **56** (4) 564-566, 569-570 (1976) [23 ref. De, en, fr] [Landesuntersuchungsamt für das Gesundheitswesen Südbayern, Aussenstelle Augsburg, Fritz-Hintermayr-Strasse 3, 8900 Augsburg, Federal Republic of Germany]

The compounds and flavour formed during liquid smoking of spices were studied by chemical and sensory examination. Spices were smoked at 300°, 330°, 360° and 390°C and examined in salt solution and after incorporation into Frankfurter-type sausages. Carbonyl compounds + phenols in smoked spice increased with temp. from 64 mg/100 g at 330°C to 88 mg/100 g at 390°C (amounts at 300°C were not measurable). In sausages, concn. of organic acids and phenols did not rise very much, but carbonyl compounds increased considerably. TLC and IR spectroscopy of DNPH (2,4-dinitrophenylhydrazine) derivatives showed that except for acetol none of the compounds had previously been identified in smoke. The bulk of the compounds formed were aromatic hydroxymonocarboxyls, possibly formed by introduction of hydroxy groups into carbonyls by the superheated steam. Sensory tests showed that both the smoked seasoning and sausages were preferred to commercial products. Liquid smoking produced a mild, pleasant, rounded aroma lacking the sharp, pungent smoke flavour. All samples contained <1 part/billion 3,4-benzpyrene. RM

191

Recent advances in meat flavour research.

[Lecture]

Chang, S. S.

International Flavours and Food Additives **7** (2) 77-80, 86 (1976) [En] [Dep. of Food Sci., Cook Coll., Rutgers Univ., New Brunswick, New Jersey, USA]

This paper, which was presented to the Society of Flavor Chemists at the Chemists' Club in New York City, on Feb. 5, 1976, considers the composition of meat flavour. It discusses meat flavour components and stresses the fact that despite the large number of compounds isolated and identified in the volatiles it is still not possible to combine them to obtain a genuine flavour characteristic of the different meats. Tabulated data present: lactones in cooked beef; S-containing compounds identified in cooked meats; furanoid compounds in cooked beef; pyrazines in cooked beef; major components of patented 'imitation meat flavour'; volatile components identified in boiled beef; and volatile components identified in canned beef stew. VJG

192

Volatile flavour components of coriander leaf.

MacLeod, A. J.; Islam, R.

Journal of the Science of Food and Agriculture **27** (8) 721-725 (1976) [9 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Campden Hill Road, London W8 7AH, UK]

Using previously reported methods of sample preparation [FSTA (1975) 7 10Q152], an essence of coriander leaf was obtained which proved to contain >25 components. Most of these have been identified, with aliphatic aldehydes providing nearly 90% of the sample. C₁₂ aldehydes are the most abundant. AS

193

Volatile constituents of Moroccan thyme oil.

Miquel, J. D.; Richard, H. M. J.; Sandret, F. G.

Journal of Agricultural and Food Chemistry **24** (4) 833-835 (1976) [16 ref. En] [Ecole Nat. Supérieure des Ind. Agric. et Alimentaires, CERDIA, 91305 Massy, France]

Moroccan thyme, *Thymus satureioides*, was extracted by steam distillation in a modified Clevenger apparatus, and the constituents of the essential oil were separated and purified by column and gas chromatography. 21 volatile constituents were characterized on the basis of their IR spectra: tricyclene, α-pinene, camphene, β-pinene, myrcene, α-terpinene, limonene, 1,8-cineole, γ-terpinene, p-cymene, trans-4-thujanol, linalool, camphor, bornyl acetate, carvacrol methyl ether, 1-terpinen-4-ol, β-caryophyllene, α-terpineol, borneol, thymol, and carvacrol. Moroccan thyme essential oil is very different from the other thyme essences, and possesses a characteristic gas chromatographic pattern. AS

the group composition of peppermint leaf extract.]

ich, V. Ya.; Shishkov, G. Z.; Polyakov, A. F.
Estiya Vysshikh Uchebnykh Zavedenii,
chevaya Tekhnologiya No. 5, 34-36 (1975) [6
Ru] [Krasnodarskii Nauchno-issled. Inst.
chevoi Promyshlennosti, USSR]

Wastes produced during peppermint processing
e extracted using liquid CO₂. Physico-chemical
acteristics (colour, odour, sp. gr. refraction
ff., solubility) and chemical characteristics
dity number, water content, methylacetate and
thol contents) are given for the peppermint
₂ extract, oil from the CO₂ extract and oil from
whole mint, and also the composition of the
₂ extract (essential oil content, contents of
ble acids, water, free and bound fatty acids,
ols, carotenoids and chlorophyll). The CO₂
t extract contained 20% of biologically active
stances including 91.82% carotenoids counted as
arotene. STI

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AB 4

TECHNIQUES FOR ANALYSIS OF FLAVOUR VOLATILES

SELECTED FROM VOLUME 9

FOOD SCIENCE AND TECHNOLOGY ABSTRACTS

Under the direction of

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Institut für Dokumentationswesen,
Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties
Landbouwdocumentatie (Pudoc), Wageningen; Zentralstelle für maschinelle Dokumentation—
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H. BROOKES

ASSISTANT EDITOR

1

[Aroma compounds in foods.]

Bemelmans, J. M. H.

TNO-Project 4 (7/8) 263-270 (1976) [7 ref. Nl]
[Cent. Inst. voor Voedingsonderzoek TNO, Zeist, Netherlands]

Topics discussed in this review-type article include: aroma compounds; research on aroma compounds; sensory evaluation; sensory quality control; toxicity of aroma compounds; and legal aspects. JA

2

[The quality of cold smoked mackerel packaged by various methods.]

Shevchenko, V. V.; Antonov, N. A.

Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 1, 71-73 (1976) [5 ref. Ru] [Leningradskii Inst. Sovetskoi Torgovli, USSR]

The quantitative and qualitative composition of volatile free fatty acids in cold smoked mackerel produced from frozen raw material and stored at 0°C was studied. The smoked fish was packed into polyethylene foil (PC-2) under vacuum and in a CO₂ atm. and the control fish were packed in parchment paper. Immediately after hermetic sealing the CO₂ content amounted to 83-95%. During storage the contents of the following acids increased, causing a rancid flavour of the product: isobutyric acid, butyric acid, isovaleric acid, valeric acid and enanthic acid. The content of the above acids was not increased when the fish were packed under vacuum or in a CO₂ atm. At the beginning of the storage period a considerable increase of polyunsaturated fatty acids was noticed (59.2%). This amount dropped rapidly in the case of fish packed in parchment paper, but with the other types of packaging no changes in the free fatty acids content were observed. STI

3

[Sensory and chemical changes in dried foods under the influence of extreme storage conditions. IV. Flavour compounds.]

Sensorische und chemische Veränderungen getrockneter Nahrungsmittel unter dem Einfluss extremer Lagerungsbedingungen. IV. Aromasubstanzen.

Römer, G.; Renner, E.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 161 (2) 167-173 (1976) [6 ref. De, en] [Entwicklungsabteilung der Milupa AG, Bahnstrasse 20-30, D-6382 Friedrichsdorf, Federal Republic of Germany]

Aroma compounds isolated from dried infant foods [see preceding abstr.] by the procedure of Römer & Renner [FSTA (1975) 7 7T315] were analysed by GLC and MS. The new components formed during storage were identified as long-chain aliphatic aldehydes. No connection was found between the chemical composition changes and the aroma changes observed. SKK

4

[Determination of steam-volatile phenols in malt.]

Die Bestimmung von wasserdampfgefährlichen Phenolen im Malz.

Kieninger, H.; Boeck, D.

Brauwissenschaft 29 (7) 197-198 (1976) [4 ref. De, en, fr] [Lehrstuhl für Tech. der Brauerei I, Tech. Univ. München, Freising-Weihenstephan, Federal Republic of Germany]

Phenols are extracted from 50 g finely ground malt by stirring with water at 45°C; the extract is then made up to 500 ml and filtered. 100-300 ml filtrate are transferred to a 500 ml flask, 3 ml 10% CuSO₄ solution are added, the mixture is adjusted to pH 4, 100 ml distilled water being added, and a total of 300 ml distillate is collected. 10 ml of 5% NH₄Cl solution are added to the distillate, pH is adjusted to 10.2 ± 0.1 with NH₄OH, and 3 ml of 2% 2-amino-antipyrine solution and 3 ml of 8% potassium hexacyanoferrate are added. The resulting coloured compound is extracted with chloroform, and determined by photometry at 460 nm. Recovery is 98-100%; steam volatile phenols in malt may be determined at concn. as low as 10 parts/billion. AJDW

5

[Effect of various distillation methods on the concentrations of volatile wine constituents in distillates.]

Einfluss verschiedener Destillationsverfahren auf die Zusammensetzung flüchtiger Weinhaltstoffe in den Destillaten.

Endres, O.; Hess, D.; Hieke, E.; Meseke, -.; Olschmke, D.; Rapp, A.; Reinhard, C.

Deutsche Lebensmittel-Rundschau 72 (7) 233-236 (1976) [7 ref. De, en, fr] [Chem. Untersuchungsamt, Speyer, Federal Republic of Germany]

Effects of distillation conditions (batch distillation, continuous column distillation, continuous distillation in all-glass apparatus) on the concn. of wine volatiles in raw brandy (intermediate distillate) and in finished brandy are discussed. Tables of data are given for concn. of numerous volatiles in the distilling wine and in the distillates. The results show approx. 100% recovery of aliphatic alcohols in the distillates. Considerable increases in ethyl acetate concn. occurred. Concn. of diethyl succinate and 2-phenylethanol decreased. The concn. of ethyl laurate apparently increased; this may, however, have been due to formation of 2-phenylethyl acetate, which is not separated from ethyl laurate by the GLC conditions used. It was found to be impossible to differentiate the intermediate distillate from the final brandy on the basis of volatiles concn. Data are given for distillation trials with German Sylvaner and Morio-Muscat wines; the Sylvaner gave brandy with a general 'wine' flavour, but the Morio-Muscat gave brandy with a distinctive varietal flavour. AJDW

6

[Study of defective coffee beans.]

Barel, M.; Challot, F.; Vincent, J.-C.;

Cafe-Cacao-The 20 (2) 129-134 (1976) [5 ref. Fr, en, de, es] [Lab. de Chimie-Tech., IFCC, Montpellier, France]

Sampling of coffee beans on Cameroon plantations revealed that 78.9% of samples contained 1 stinker bean/300 g and 1-50 stinkers/2000 beans (0.05-2.5%). Cherry samples from the same plantations were treated by the growers themselves, or in the laboratory. Results showed that careful treatment prevented the production of stinker beans. A laboratory study revealed the effect of temp. on the appearance of the stinker bean defect which might follow the death of the embryo through rise in temp. during cherry storage: stinker beans were found when cherries were heated for 24 h at 55°C or 48 h at 45°C, especially after long fermentation (4 days). Comparison of volatile compounds from healthy and stinker beans by extraction of aromas under vacuum with grinding and MS-GLC revealed increases in the methanol and ethanol peaks and a change of their ratio, increases in acetoin and acetic acid and the presence of butane-2,3-dione (diacetyl) and butane-2-diol, as well as butane, butanol, isobutanol, pentane-3-one and pentane-2,3-dione. RM

7

[Origin of hydrogen sulphide odour in wines and methods of prevention.]

Malik, F.

Vinohrad 14 (5) 112-113 (1976) [12 ref. Sk]

[Chemickotech. Fak. SVST, Bratislava, Czechoslovakia]

H₂S originates in wines during spontaneous fermentation and during the stationary phase of fermentation. Its formation is dependent mainly on the yeast strain and the presence of certain metallic ions, especially Cu. The H₂S or mercaptan odour also often develops in wines in contact for long periods with yeasts bottoms. The odour can be removed by sulphitation, when the H₂S is oxidized to elementary S, which separates out from the wine as an amorphous precipitate. Another method suitable for removal of H₂S and mercaptans from wines, accepted in Austria and Federal Germany, is based on reaction with silver chloride finely dispersed on silica. STI

8

[Quantitative determination of volatile compounds in distillates.]

Khrabakhov, T. S.

Vinodelie i Vinogradarstvo SSSR No. 2, 37-39 (1976) [Ru] [Vserossiiskii NIIViV, USSR]

A method for quantitative detn. of volatile compounds in wine distillates is based on gas chromatography with direct injection of the analysed samples, using capillary columns filled

with mixtures of PEG-60K, Reoplex-40K and 1,2,3-tris (β-cyanoethoxy)-propane as the stationary phase. These columns achieved satisfactory resolution of 25-35 compounds, resolution of which is usually difficult e.g. ethyl acetyl-ethyl acetate, methanol-ethanol, ethyl butyrate-butanol-2-isoamyl alcohol. A quantitative detn. could be obtained for compounds with contents >1 mg/100 ml. The relative error was in most cases <10%. STI

9

[Studies on the nature of the taste of lipids. IV. Taste of thermally oxidized soybean oil.]

Usuki, R.; Kaneda, T.

Journal of Japan Oil Chemists' Society [Yukagaku] 25 (4) 199-202 (1976) [13 ref. Ja, en] [Dep. of Food Chem., Fac. of Agric., Tohoku Univ., Japan]

The components of the polar fraction (in isopropyl ether:ethyl ether 1:1) from heat-oxidized soybean oil were separated by gel permeation chromatography on Sephadex LH-20 and Bio-Beads SX-1. The fraction obtained after the 2nd chromatography had meat mol. wt. 306 and no longer had the heated-oil taste after passing through the Schwartz column. 2,4-decadienal and several 2-alkenals containing 4-10 C atoms were detected in the carbonyl compounds eluted from the Schwartz column. These results showed that the glycerides in the oxidized oil are all tasteless while carbonyl compounds had the heated-oil-like taste. [See FSTA (1974) 6 4N183 for part III.] RM

10

[Studies on the nature of the taste of lipids. V. Taste of the volatile decomposition products in thermally oxidized soybean oil.]

Usuki, R.; Kaneda, T.

Journal of Japan Oil Chemists' Society [Yukagaku] 25 (4) 203-206 (1976) [20 ref. Ja, en] [Dep. of Food Chem., Fac. of Agric., Tohoku Univ., Japan]

Volatile decomposition products obtained in 0.05% yield during molecular distillation of thermally oxidized soybean oil were fractionated into free fatty acids (51%), lactones (6%), sterols and alcohols (31%) and carbonyl compounds (13%) and examined for their flavour profile. Besides the previously detected alkenals, 2-nonenoic-γ-lactone and 1-pentene-3-ol were tested. Results showed that the flavour of heated oil was due mainly to lactones and carbonyl compounds. [See preceding abstr.] RM

11

Correlation of gas chromatographic profiles and organoleptic scores of different fats and oils after simulated deep fat frying.

Blumenthal, M. M.; Trout, J. R.; Chang, S. S.

Journal of the American Oil Chemists' Society 53 (7) 496-501 (1976) [18 ref. En] [Dep. of Food Sci., Cook Coll., Rutgers, State Univ. of New Jersey, New Brunswick, New Jersey 08903, USA]

5 oils and a fat were subjected to simulated deep fat frying using moist cotton balls. The used oils were evaluated by an expert organoleptic panel. Statistically significant differences were found in the odours and flavours of the used oils. Volatile decomposition products of the used oils were quantitatively isolated by high vacuum cryogenic entrainment and then analysed by GLC. The volatiles from each used oil yielded a gas chromatogram which was qualitatively and quantitatively different from the others. A statistical analysis was used to correlate the organoleptic scores with the profile gas chromatograms from the used oils. Excellent correlations between gas chromatographic peak areas and organoleptic scores were established. However, limitations in the number of samples tested and limitations in the statistical design do not permit drawing conclusions of cause and effect. AS

12

[Study of changes in butter quality during storage at subzero temperatures.]

Petrukhina, E. P.; Piskarev, A. I.

Kholodil'naya Tekhnika No. 3, 41-44 (1976) [11 ref. Ru] [Vses. Nauchno-issled. Inst. Kholodil'noi Promyshlennosti, USSR]

Changes in contents of free aliphatic acids, volatile carbonyl compounds and free volatile aliphatic acids in butter stored at -30°C were studied. Butter stored at -18°C was used as a control. At -30°C, the butter retained its aroma constituents, and there was a lower accumulation of secondary oxidation products. Consequently, for long-term storage of butter, a temp. of -30°C is recommended. STI

13

Variations in the volatile flavour components of eggs.

MacLeod, A. J.; Cave, S. J.

Journal of the Science of Food and Agriculture 27 (9) 799-806 (1976) [13 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Campden Hill Road, London W8 7AH, UK]

Previously developed techniques for the collection and analysis of the volatile flavour components of the hen's egg [FSTA (1975) 7 10Q152] were employed in a comparative survey of the variations in the nature of the flavour components in samples from different types of egg and egg products. Whilst no significant differences were observed between the results for battery eggs and free-range eggs, and between those of white-shelled and brown-shelled eggs, differences were observed between eggs of different ages and between egg yolk and whole egg. 2 types of dried egg (spray-dried, accelerated freeze-dried) were also studied. AS

14

[The volatile reducing substances value as a quality indicator for fish and fish products.]

Witas, T.; Olbromska, E.

Przemysl Spozywczy 30 (4) 146-148 (1976) [8 ref. Pl, ru, en, de, fr] [Inst. Rybolowstwa Morskiego, Szczecin, Poland]

A method for detn. of volatile reducing substances (VRS) in fish based on those of Farber [Food Technology (1956) 10 (7) 303], Lang et al. [Industrial & Engineering Chemistry, Analytical Edition (1944) 16, 490] and Segall & Proctor [Food Technology (1959) 13 (5) 383] but omitting the pressing out of juice is described in detail, and the apparatus for trapping the substances in alkaline KMnO_4 solution is illustrated. The amount of VRS was expressed as the VRS value, i.e. the quantity (mg/kg) of ascorbic acid of equivalent permanganate-reducing power. Sparr, herring, mackerel, hake and carp, fresh or stored (frozen or refrigerated) for different times were tested. The results are graphically presented. The values ranged from 0.75-2.86 for fresh fish or fish at the beginning of storage to 8.50-24.83 for fish at the end of long-term storage, depending on temp. SKK

15

Volatile sulfur compounds contributing to meat flavour. I. Components identified in boiled meat.

Garbusov [Garbuzov], V.; Rehfeld, G.; Wölm, G.; Golovnja [Golovnya], R. V.; Rothe, M.

Nahrung 20 (3) 235-241 (1976) [22 ref. En, de, ru] [Inst. of Element-Organic Substances of the Acad. of Sci. of USSR, Moscow, USSR]

Volatile S compounds separated from 3 samples of boiled beef (*longissimus dorsi* or shoulder muscle) were separated by N_2 stripping and precipitated with HgCl_2 . After regeneration, the volatile S-compounds were analysed by GLC. A table of results is given. 39 volatile S compounds were identified (10 tentatively); these comprised 17 thiols, 8 sulphides, 7 di- or tri-sulphides, and 7 heterocyclic S compounds. Only 10 of these compounds have previously been detected in boiled meat. IN

16

[Natural aroma compounds.]

Peyron, L.

Revue de la Conserve Alimentation Moderne No. 44, 27-29, 32 (1976) [Fr] [Lautier Fils SA, France]

This illustrated review-type article deals with EEC and French definitions of and regulations on natural aroma compounds; methods of their preparation; places of production and processing; various uses; and future prospects. SKK

17

Correlation of odor intensities and vapour pressures with structural properties of odorants.

Dravnieks, A.

Abstracts of Papers, American Chemical Society 172, AGFD 81 (1976) [En] [IIT Res. Inst., Chicago, Illinois 60616, USA]

In flavour research, the concn. of an odorant needed to attain a certain odour intensity is a potentially more significant parameter than its odour threshold. Such iso-intensity concn. for different odorants depend on their vapour pressures and molecular structures. A convenient vehicle for inventorying the features of the molecular structures is line-formula (Wiswesser) chemical notation. Experiments on correlating odour intensity parameters and vapour pressures with molecular features derivable from line-formulas were conducted. They demonstrated a potential usefulness and feasibility of computerized estimates of odour intensity and vapour pressure from line-formula scans. AS

18

Long-chain acetates as internal standards in the gas-liquid chromatography of volatile fatty acids.

Mielniczuk, Z.; Korolczuk, J.; Jakubowski, A.

Journal of Chromatography 125 (2) 444-446 (1976) [3 ref. En] [Inst. of Food & Nutr., 61/63 Powsinska Street, Warsaw, Poland]

19

[Gas chromatographic characterization of whisky. I.

Analytical method.] Gaschromatographische

Charakterisierung von Whisky. I.

Untersuchungsmethodik.

Postel, W.; Adam, L.

Branntweinwirtschaft 116 (14) 249-254 (1976)

[14 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

GLC procedure for detn. of volatile in spirits are described; 5 column types (FFAP, Igepal, Ucon-LB-550x, Carbowax 400, triethanolamine) are used. Recovery and reproducibility are considered. A total of 64 volatiles may be determined in spirits by these procedures; of these, 49 components (14 alcohols, 25 esters, 10 carbonyl compounds) may be detected and identified in whisky. TUB-IGB

20

[Gas chromatographic-mass spectrometric investigation of the volatile components of wines.

VII. Aroma compounds of Tokay aszu wines. (b).

Organic acids.] Gaschromatographisch-massenspektrometrische Untersuchung flüchtiger Inhaltsstoffe des Weines. VII. Aromastoffe in Tokajer Weinen. (b). Organische Säuren.

Drawert, F.; Schriber, P.; Leupold, G.; Kerenyi, Z.; Lessing, V.; Junker, A.

Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 162 (1) 11-20 (1976) [47 ref. De, en] [Inst. für Lebensmitteltech. & Analytische Chemie, Tech. Univ., Munich, Federal Republic of Germany]

A study was made of the organic acids detectable by liquid-liquid extraction in various Tokay wines. After separation of acidic compounds from aroma extracts using Na_2CO_3 and after derivatization with diazomethane, 65 methyl esters were separated by gas chromatography and identified by MS. Using a special fractionation method, organic acids, amino acids, carbohydrates and phenolic compounds were isolated. After derivatization of the components, 50 organic acids were quantitatively determined by gas chromatography. The acid compositions of the wines differ considerably. Quantitative differences are due to the vintage, method of production and storage conditions. Possible biosynthetic pathways for the various acids are discussed. [See FSTA (1976) 8 12H2053 for part VI.] AS

21

[Determination of aroma substances in fruit and vegetable juices.]

Fan-Yung, A. F.; Khotivari, A. V.

Konservnaya i Ovoshchesushil'naya

Promyshlennost' No. 2, 34-37 (1976) [Ru]

[Odesskii Tekh. Inst. Pishchevoi Promyshlennosti im. M. V. Lomonosova, USSR]

Volatile aroma substances were determined in paprika, apple, tomato, apricot, beetroot and cranberry juices, and in various 2-juice combinations. 500 ml juice were extracted by a mixture of 120 ml ethyl ether and 120 ml n-pentane, the extract was washed with 2% NaHCO_3 , dehydrated by anhydrous Na_2SO_4 and conc. in a micro-evaporator to 0.5 ml. The composition was determined by gas chromatography. Analysis of the juices in the order quoted above showed the following volatile component groupings (mg/l.): higher alcohols, 68.95, 175.14, 218.17, 115.7, 112.3 and 73.56; complex esters, 39.26, 109.9, 71.24, 48.47, 45.08 and 97.68; terpenoids, 33.0, 56.6, 35.5, 113.8, 20.2 and 29.7; and furfurols, 12.0, 12.0, 15.0, 14.0, 13.0 and 8.0. Contents of 29 individual volatile constituents are also tabulated; main constituents were n-propanol, linalool, isoamylol, ethyl caprylate, ethyl benzoate, decanol, geraniol and diethyl esters of malic acid. Contribution of the individual constituents to the juices' flavour is discussed. STI

22

[Results of studies of bouquet formation in

brandies.] Ergebnisse von Untersuchungen über die Bukettbildung bei Weinbränden.

Litschew, W. I. [Lichev, V. I.]

Mitteilungen: Rebe, Wein, Obstbau und

Fruchtverwertung 26 (2/3) 139-148 (1976) [26 ref. De, en, fr]

3 Bulgarian brandies (Pliska, Preslav, Slantshev Brjag) and 2 French cognacs (Martell, Napoleon) were subjected to gas chromatography in an attempt to establish which compounds play a role in the bouquet of brandy. Gas chromatograms are given and the contents of a wide variety of volatile compounds (e.g. aldehydes, higher alcohols, esters, terpenes) found in the 5 brandies are tabulated. 2 oak wood extracts were similarly analysed by gas chromatography. The following conclusions were reached. Aromatic and higher aldehydes are responsible for the 'vanilla' flavour of French cognacs, and the highly volatile esters produce the characteristic 'cognac' flavour. High alcohols play a prominent role in the bouquet of freshly distilled brandies. Terpene compounds produce the delicate flowery aroma characteristic of Pliska and Preslav brandies. JA

23

[Volatile phenolic compounds in beer, smoked beer and sherry.] Flüchtige phenolische Verbindungen in Bier, Rauchbier und Sherry.

Tressl, R.; Renner, R.; Apetz, M.

Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 162 (2) 115-122 (1976) [31 ref. De, en] [Lehrstuhl für Chem.-tech. Analyse, Tech. Univ., Berlin (West)]

The volatile phenolic compounds of beer, wort, smoked beer and sherry were enriched, separated, identified and quantified by means of column chromatography, gas chromatography and MS. The products showed significant qualitative and quantitative variations in their contents of phenolic compounds. Predominant phenolics were: in wort, hordenine (10.0 ppm); in Pilsner beer, tyrosol (2.8 ppm) and hordenine (2.9 ppm); in dark strong beer, tyrosol (6.8 ppm) and hordenine (7.1 ppm); in smoked beer, 2-phenylethanol (10 ppm); and in sherry, tyrosol (4900 parts/billion). Sources of phenolic compounds include the thermal breakdown of phenol carboxylic acids, microbial actions, and extractive substances from oak casks and smoke products. JA

24

[Aroma characteristics of non-alcoholic beverages, analysed by capillary gas chromatography.]

Farkas, J.; Hrivnak, J.

Kvasny Prumysl 22 (3) 63-67 (1976) [26 ref. Sk, ru, en, de] [Vyzkumne Pracovisko Vinarskych Zavodov v Modre, Czechoslovakia]

A gas chromatographic process for quantitative analysis of aroma compounds used for the production of non-alcoholic beverages is described; the method used for isolating compounds by freezing is also given in detail. Chromatograms of the aroma compounds of commercial beverages (Kofola, Vinea, Chito, Coca-Cola and Pepsi-Cola) are shown, together with a diagram of a proposed modification to the metering zone of the chromatograph. STI

25

Composition of lemon oil distilled from commercial mill waste.

Lund, E. D.; Bryan, W. L.

Journal of Food Science 41 (5) 1194-1197 (1976) [19 ref. En] [USDA Citrus & Subtropical Products Lab., S. Region, Winter Haven, Florida 33880, USA]

Distilled lemon peel oil, a source of flavouring components, was recovered by steam stripping of waste aqueous effluent emulsion from a lemon oil mill. Compositions of distilled and cold-pressed oils were compared. Distilled oil was richer in the sparingly water-soluble oxygenated flavour components, linalool, terpinene-4-ol and α -terpineol. Conc. of citral, the major lemon flavouring component, was the same in both oils; but conc. of neryl acetate and some unidentified higher boiling components were lower in distilled oil. Odour evaluations and analytical results indicated that distilled oil may be a valuable source of lemon flavouring components. IFT

26

Quantitative analysis of aldehydes, esters, alcohols and acids from citrus oils.

Braddock, R. J.; Kesterson, J. W.

Journal of Food Science 41 (5) 1007-1010 (1976) [24 ref. En] [Univ. of Florida, Inst. of Food & Agric. Sci., Agric. Res. & Education Cent., PO Box 1088, Lake Alfred, Florida 33850, USA]

Actual amounts of octanal, decanal, dodecanal, tetradecanal, geranial and neral in various cold-pressed citrus oils were determined by quantitatively preparing and analysing the 2,4-dinitrophenylhydrazone derivatives. These major and other minor carbonyl components in citrus oils were separated and isolated using a combination of column chromatography and TLC of the derivatives. Differences in aldehyde composition include nearly equal amounts of octanal and decanal in Valencia orange oil and significantly less decanal than octanal in Pineapple, Hamlin and Temple orange oil. Tangerine oil has nearly equal amounts of octanal and decanal, but lesser quantities than the orange oils. Valencia essence oil, manufactured commercially by decantation from the aqueous essence phase recovered during juice evaporation, contained almost twice as much decanal as octanal. Cold-pressed oils generally showed higher aldehyde/ester ratios than essence oils. The higher ester contents of the essence oils accounted for a more juice-like aroma of the latter. Quantitative chemical analyses of total aldehydes, esters, alcohols and acids of 8 types of citrus oil were performed. These analyses illustrated basic compositional differences in the oxygenated components of orange, mandarin, grapefruit and essence oils. IFT

27

Organoleptic techniques in chromatographic food flavor analysis.

Parliment, T. H.; Scarpellino, R.

Abstracts of Papers, American Chemical Society 172, AGFD 80 (1976) [En] [General Food Tech. Cent., White Plains, New York 10625, USA]

This paper presents a scheme which has been developed for establishing the organoleptic importance of the components of a flavour. The procedure involves collecting the salient portion of a gas chromatographic effluent in an appropriate media and then evaluating the individual fractions and combinations by modified flavour profile techniques. The determination of the major characterizing components of blueberry aroma is used to illustrate the utility of these procedures. AS

28

Identification and synthesis of two new organic sulphur compounds from the yellow passion fruit (*Passiflora edulis* F. flavicarpa).

Winter, M.; Furrer, A.; Willhalm, B.; Thommen, W.

Helvetica Chimica Acta 59 (5) 1613-1620 (1976) [7 ref. En] [Firmenich SA., Res. Dep., 1211 Geneva 8, Switzerland]

3-methylthio-hexanol and a mixture of cis- and trans-2-methyl-4-propyl-1,3-oxathiane were identified in a commercial flour concentrate of yellow passion fruit of Hawaiian origin by GLC, MS and NMR spectrometry. Syntheses of these new flavour constituents are described. AS

29

[Constituents of the essential oil from fruit *Canarium album* Raeusch.]

Kameoka, H.; Cheng, Y.; Miyazawa, M.

Journal of the Pharmaceutical Society of Japan [Yakugaku Zasshi] 96 (3) 293-298 (1976) [10 ref. Ja, en] [Dep. of Applied Chem., Fac. of Sci. & Eng., Kinki Univ., Kowabe, Higashi-Osaka, 577, Japan]

An essential oil was obtained with 0.11% yield by steam distillation from the fresh fruit of *C. album*. The oil was treated successively with 5% Na₂CO₃ and 5% NaOH solution and separated into neutral, Na₂CO₃-soluble and NaOH-soluble fractions. 49 components of the neutral fraction including alkanes C₁₀ to C₃₂, 14 kinds of carboxylic acids and 6 phenolic compounds identified from their IR, mass and NMR spectra and by chemical methods are tabulated. RM

30

[The storage period of frozen semi-processed products from root vegetables.]

Skorkova, Yu. G.; Gavrilishina, L. I.
Konservnaya i Ovoshchesushil'naya

Promyshlennost' No 2, 30-32 (1976) [1 ref. Ru] [Krasnodarskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, USSR]

Losses of volatile oils occur during storage of frozen semi-processed products from root vegetables, due to oxidation of vegetables kept in open or carton trays. Experiments show that e.g. dill, containing 192 mg volatile oils/100 g when fresh, should not drop below 32-42 mg/100 g if satisfactory results according to a recipe are to be expected. Similar values exist for parsley (tops) (117 mg/100 g and 50 mg/100 g) and celery (tops) (42.4 and 20 mg/100 g). In dill and parsley these values are reached after 6 months, in celery after 4 months. A gas chromatographic method to assess the contents of specific volatile oils is described; these volatile substances are α -phellandrene, terpinolene and carvone. The storage period can be extended by washing, blanching, cooling and moisture separation, followed by freezing and pressing at 0.1 MPa into briquettes. The briquettes are wrapped in polyethylene foil and stored at -18°C. Fresh vegetables may also be pressed and frozen with the incorporation of solid CO₂ inside the briquettes. The content of volatile oils then remains within permissible limits for 12 months. STI

31

Volatile flavour components of garden cress.

MacLeod, A. J.; Islam, R.

Journal of the Science of Food and Agriculture 27 (10) 909-912 (1976) [14 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Campden Hill Road, London W8 7AH, UK]

An essence of garden cress proved to contain only 11 components. 8 have been identified; all are glucosinolate degradation products (isothiocyanates and nitriles), and constitute >95% of the sample. Benzyl derivatives, from glucotropaeolin, are the most abundant. No thiocyanates were obtained. AS

32

Volatile flavour components of walnuts (*Juglans regia* L.).

Clark, R. G.; Nursten, H. E.

Journal of the Science of Food and Agriculture 27 (10) 902-908 (1976) [10 ref. En] [Atkin-Thompson Lab., Procter Dep. of Food & Leather Sci., Univ., Leeds, LS2 9JT, UK]

The volatile components of walnut oil obtained by solvent extraction were investigated. 2 essences were prepared, one using the Likens-Nickerson concurrent distillation-extraction apparatus and the other by high vacuum degassing. The essences were submitted to GLC-MS analysis and sensory evaluation of the components eluted from GLC capillary columns. 29 compounds were identified, including 8 carbonyls, 4 alcohols and 2 terpenes. The odour of walnuts appears to be due to the collective effect of a number of components. AS

33

[Analysis of carbonyl compounds by reverse phase liquid chromatography.]

Piergiovanni, L.; Volonterio, G.

Rivista Italiana delle Sostanze Grasse 53 (4) 99-101 (1976) [27 ref. It, en] [Istituto di Ind. Agrarie dell'Univ., Milan, Italy]

The best known methods for isolation, separation and identification of monocarbonyl compounds were examined during a study on oxidation products of a cheese fat. As the methods were unsatisfactory, a reverse phase chromatographic method for separation of the 2,4-dinitrophenyl hydrazone (DNPH) derivatives was developed. The method has the advantages of speed, accuracy and reproducibility for quantitative detn. of homologous series. Working conditions for separation of 2,4-DNPH derivatives of 2-alkanones (methyl ketones) and n-aldehydes in standard mixtures are described. AS

34

[Determination of hexamethylenetetramine and volatile aldehydes in cheese and other milk products.] Bestimmung von Hexamethylentetramin und flüchtigen Aldehyden in Käse und anderen Milchprodukten.

Thomasow, J.; Sprenger, U.; Wollesen, C.

Milchwissenschaft 31 (6) 334-338 (1976) [9 ref. De, en] [Inst. für Chemie der Bundesanstalt für Milchforschung, Kiel, Federal Republic of Germany]

Hexamethylenetetramine (HMT) in Italian Provolone cheese is determined by a modification of the Antonacopoulos method [FSTA (1969) 1 3A78] which employs steam distillation of 10 g sample in 10% H₂SO₄; the formaldehyde collected in the distillate is estimated colorimetrically using chromotropic acid. Part of the formaldehyde released does not reach the distillate, being retained by interaction with certain amino acids. A calibration curve must therefore be prepared, based on the formaldehyde recovered on similar treatment of known mixtures of HMT and HMT-free cheeses. The more sensitive reagent 2-hydrazono-2,3-dihydro-3-methylbenzothiazole hydrochloride, suitable for the detn. of volatile aldehydes in dairy products, can advantageously replace chromotropic acid for the estimation of HMT in cheese provided this is free from aldehydes. The method can detect 2 ppm HMT. German regulations permit a max. of 25 mg HMT/kg Provolone cheese. GTP

35

[The significance of volatile aroma compounds in fish. III.] Über die Bedeutung flüchtiger Aromastoffe bei Fisch. III.

Trommsdorff, H.

Deutsche Lebensmittel-Rundschau 72 (9) 313-318 (1976) [De] [Inst. für Biochem. & Tech., Bundesforschungsanstalt für Fischerei, Hamburg, Federal Republic of Germany]

GLC studies on the amine composition of the total volatile base fraction of herrings stored in ice for 21 days are described. A total of 29 amines were detected, of which 12 primary, secondary and tertiary amines were identified. Tables and graphs of results are given. Changes in the concn. of the individual amine fractions during storage are discussed; variations in amine concn. were complex. The effects of the isolation technique used on the amine composition of the total volatile base fraction are briefly discussed, with reference to a table of amine concn. in samples isolated by 6 methods. [See FSTA (1976) 8 9R561 for part II.] AJDW

36

Identification of some volatile compounds in cooked chicken.

Horvat, R. J.

Journal of Agricultural and Food Chemistry 24 (5) 953-958 (1976) [7 ref. En] [Anim. Products Util. & Marketing Res. Lab., Richard B. Russell Res. Cent., USDA, Athens, Georgia 30604, USA]

A fraction isolated from boiling chicken broth by continuous steam distillation and pentane extraction was analysed by GLC/MS with both packed and open tubular columns. Some of the compounds separated by GLC were trapped and identified by MS and IR analysis. In addition, headspace vapour above boiling chicken broth was analysed for gaseous compounds by gas-solid chromatography. Of the 53 compounds identified, 30 had not been previously identified in cooked chicken. The 53 included S compounds, aldehydes, alcohols, amines, acids, 2-alkylfurans, ketones, hydrocarbons (cyclic and acyclic), alkylbenzenes, a terpene, and a nitrile. AS

37

[The essential oil and concrete of the Turkish rose (*Rosa damascena*).] [Lecture]

Garnero, J.; Guichard, G.; Buil, P.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 58 (3) 160-179 (1976) [19 ref. Fr, it, en, de, es] [Lab. de Recherches des Ets. P. Robertet & Cie, F 06130 Grasse, France]

Topics discussed in this review include: the botanical origin of the Turkish rose and its geographical limits; climate, temperature and rainfall in rose-growing areas in Turkey; cultivation of the Turkish rose; diseases and insect attack; harvesting and storage of the roses; hydrodistillation methods for the Turkish rose; extraction of the rose with volatile solvents; production of essential oil and concrete; physico-chemical properties of the essential oil; physico-chemical properties of the concrete and absolute; and study by vapour-phase chromatography of the composition of the essential oil and absolute. JA

38

[Some new constituents of the essential oil of *Hyssopus officinalis* Linnaeus.]

Joulain, D.; Ragault, M.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 58 (3) 129-131 (1976) [9 ref. Fr, it, en, de, es] [Lab. de Synthese Totale de Produits Naturels, Fac. des Sci., BP 535, 72017 Le Mans Cedex, France]

The preliminary results of a systematic study of the constituents of the essential oil of *Hyssopus officinalis* are reported. By a combination of fractional distillation, silica gel column chromatography and preparative gas chromatography, a large number of constituents were isolated. The structure of 19 of these constituents was determined. 4 of them (methyl myrtenate, 2-hydroxy-iso-pinocamphone, cis-pinic acid, cis-pinonic acid) had not previously been identified in plant products. JA

39

[Some problems encountered during the preparation, control and analytical study of essential oils.] [Lecture]

Garnero, J.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 58 (3) 105-127 (1976) [94 ref. Fr, it, en, de, es] [Ets. P. Robertet, F 06333 Grasse, France]

40

Oil and oleoresin of turmeric.

Krishnamurthy, N.; Mathew, A. G.; Nambudiri, E. S.; Shivashankar, S.; Lewis, Y. S.; Natarajan, C. P. *Tropical Science* 18 (1) 37-45 (1976) [15 ref. En] [Cent. Food Tech. Res. Inst., Mysore 570013, India]

12 turmeric cultivars which are commonly grown in India were analysed in order to determine their suitability for the extraction of oil and oleoresin. Their volatile oil content ranged from 2.5 to 7.2% and their curcumin content from 1.8 to 5.4%. The release of oil during distillation was slow because of the presence of high-boiling sesquiterpene derivatives. The bright yellow colour of turmeric was found, by TLC to be due to curcumin and to 2 other related pigments with the same absorption max. (425 nm) in the visible region. Acetone, alcohol and ethylene dichloride were found to be suitable for extracting the oleoresin from turmeric. Both the Soxhlet and the cold percolation extraction methods gave good yield of oleoresin, with a good recovery of curcumin (>85%), when finely ground spice (>60 mesh) was used. Bench-scale extractions, by stainless steel columns and a distillation unit, gave turmeric oleoresin which conformed to specifications of the Essential Oil Association, USA. AS

41

[Principal chemical components of "*Pluchea sagittalis* (Lamarck) Cabrera".] [Lecture]

Talenti, E. C. J.

Essenze Derivati Agrumari 46 (1) 40-57 (1976) [27 ref. Es] [Dep. de Ciencias Biol. de la Univ. Nacional del Litoral, Santiago del Estero 2829, Santa Fe, Argentina]

Samples of *Pluchea sagittalis*, commonly known as Lusera, and used as an ingredient in an aperitif were analysed. Direct analysis of plant material revealed the presence of tannins, esteroids, phytosterols, flavonoids, saponins and essential oils. TLC and UV and IR spectrometry of derivatives identified pyrocatechin, resorcinol, pyrogallol, the glucoside quercitrin and the flavonoid pigment quercetin. The presence of phloroglucinol, coumarin and anthraquinone was suspected. Benzoic, salicylic and gallic acids were also detected. None of the samples contained alkaloids, leucoanthocyanidins, cardiotonic or cyanogenic glycosides. RM

42

[Essential oil of "*Pluchea sagittalis* (Lamarck) Cabrera".] [Lecture]

Talenti, E. C. J.

Essenze Derivati Agrumari 46 (1) 58-71 (1976) [36 ref. Es] [Dep. de Ciencias Biol. de la Univ. Nacional del Litoral, Santiago del Estero 2829, Santa Fe, Argentina]

The essential oil from *P. sagittalis* was studied by adsorption chromatography, GLC, UV and IR spectrometry. The following compounds were identified: α -pinene, camphene, β -pinene, limonene, 1,8-cineol, p-cymene, linalool, camphor, D-bornyl acetate, caryophyllene, α -terpineol, borneol, citranellol, geranyl acetate and geraniol. Some differences between samples from different soils and locations were attributed to unknown ecological reactions. RM

43

[GLC characterization of mint essential oils.]

Tateo, F.

Rivista Italiana delle Sostanze Grasse 53 (3) 77-87 (1976) [14 ref. It, en] [Istituto di Tecnologie Alimentare, Univ. di Milano, Milan, Italy]

The optimum conditions for GLC characterization of mint essential oils were studied with reference to Piemont-produced *Mentha piperata* Italo-Mitcham and *Mentha arvensis* piperascens (Brazilian), mixtures of the 2, and adulterated samples containing synthetic compounds (linalool, terpineol, benzyl alcohol). The ratio of menthyl acetate (peak q) to neomenthol (peak r) was an important characteristic (q:r is >1 in Italo-Mitcham, and <1 in Brazilian oil). Chromatograms were obtained in about 90 min at column temp. 140°C (15% Carbowax 20 M on Chromosorb W), about 35 min at 160°C and <30 min at 180°C. Not all the peaks were clearly resolved at 180°C. RM

44

Comparison of sample preparation techniques for gas chromatographic analysis.

Jeanings, W. G.

Abstracts of Papers, American Chemical Society 172, AGFD 130 (1976) [En] [Dep. of Food Sci., Univ. of California, Davis, California 95616, USA]

The methods used to isolate trace volatiles for gas chromatographic analysis can exercise profound effects on the resultant chromatogram. The pretreatment and preconcn. procedures used usually cause qualitative and quantitative changes in the sample. A model system, whose constituents covered a wide range of volatilities and functional groups, was examined neat and in dilute aqueous solution by a variety of sampling techniques. Wall-coated open tubular (WCOT) glass capillary columns, achieving baseline separation of all components, permitted realistic comparisons of the different isolation and concn. procedures. Results indicated that no single sampling procedure is uniformly satisfactory, but that, depending on the sample composition and the compounds of interest, one or another procedure may be superior. A number of samples, including fruit and meat products, were subjected to selected sampling techniques, and examined on WCOT glass capillary systems. AS

45

Isolation of volatile components from a model system.

Schultz, T. H.; Flath, R. A.; Mon, T. R.; Teranishi, R.

Abstracts of Papers, American Chemical Society 172, AGFD 131 (1976) [En] [W. Regional Res. Cent., USDA, Berkeley, California 94710, USA]

A study was made of the degree of recovery of various compounds from an aqueous system by simultaneous steam distillation and extraction with an organic solvent. The apparatus used was a modification of that described by Nickerson & Likens [Journal of Chromatography (1966) 21, 1]. The model system was a dilute buffered solution of 12 chosen volatile constituents, representative of those found in fruits or essential oils. Analysis of the recovered material was done by quantitative gas chromatography. The effects of time of distillation-extraction, pressure (temp.), pH, and type of organic solvent on the degree of recovery of each of the compounds are discussed. AS

46

Apparatus for the isolation of trace volatile constituents from foods.

Chang, S. S.

Abstracts of Papers, American Chemical Society 172, AGFD 132 (1976) [En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

3 systems were designed and built for the isolation of volatile flavour compounds from foods. The first was designed for solid foods, such as roast

beef, or aqueous foods, such as orange juice. The principle of fresh vaporization followed by evaporation from a heated continuous thin film under vacuum was utilized. The second was designed for fats and oils in large quantities. It was based upon semi-continuous counter-current vacuum steam distillation. The third was designed for fats and oils in small amounts. The principle of falling film molecular distillation under a current of water vapour was used. The volatile flavour compounds isolated by the systems were evaluated organoleptically by an expert panel. Only when the panel concluded that the isolated flavour compounds did have the genuine characteristic flavour of the original food, and that they did not contain flavour produced by artifacts, such as decomposition reactions during the isolation processes, were the isolated compounds submitted to fractionation and identification. AS

47

The use of Porapak trap and solvent extraction methods in isolating volatiles from a heated D-glucose/hydrogen sulfide/ammonia model system.

Shibamoto, T.; Russell, G. F.

Abstracts of Papers, American Chemical Society 172, AGFD 154 (1976) [En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

48

The procedure of isolation and preparation of volatile compounds from foodstuffs for gas chromatograph-mass spectrometer analysis.

Mielniczuk, Z.; Daniewski, M.

Acta Alimentaria Polonica 2 (1/2) 101-105 (1976) [5 ref. En, pl] [Inst. Zywnosci i Zywienia, Warsaw, Poland]

A new method of isolation and preparation for gas chromatography-MS analysis of volatile compounds from processed meat and model Maillard reaction products involves separation of volatiles with N₂ stream and entrapping in a steel pipe cooled with a solid CO₂-ethanol bath and filled with glass beads. Subsequently the entrapped compounds are washed out with diethyl ether using a polyethylene syringe, collected in an ampoule placed in a solid CO₂-ethanol bath, and injected onto the GC column with a cooled syringe. Volatiles in closed ampoules can be stored under refrigeration for up to 2 wk. Chromatograms of volatiles from roast beef showed 53 peaks using the new method, vs. 28 peaks for gas valve injection. The new method also permits several injections of volatiles collected from the same sample. [See also FSTA (1974) 6 8A363.] AL

49

I. Concentration and analysis of trace volatile organics in gases and biological fluids with a new solid absorbent. II. Photo-electro-capture detector.

Tishbee, A. Y.

Dissertation Abstracts International, B 36 (11) 5549 Order No. 76-9914 (1976) [En]

A new procedure for sampling, transfer, and analysis of volatile organic compounds by gas chromatography had been developed. An adsorbent trap ultimately becomes an insert for a modified injector port, and a valve system allows the sample to be transferred to a cooled pre-column and finally to a separating column. Several traps may be used for sampling (for multiple injections), and it has been established that such traps may be stored without loss of sample. The ease and reproducibility of this procedure is amenable for the investigation of volatile organic compounds involving air and water pollution, flavour and aroma analysis, and body fluid metabolites. AS

50

[Studies of the separation and determination of dicarbonyl compounds by gas chromatography.]
Sin, M.-G.; Nam, C.-W.

Korean Journal of Food Science and Technology 8 (2) 85-89 (1976) [10 ref. Ko, en] [Dep. of Food & Nutr., Dong Duck Women's Coll., Korea]

Separation and detn. of dicarbonyls, such as diacetyl, methyl glyoxal and triose reductone, in aqueous solution were achieved by gas chromatography after transformation of the dicarbonyls into quinoxaline derivatives with o-phenylenediamine. The column used consisted of Celite 545 (80-100 mesh) coated with 5% Silicon Gum SE-30; column temp. was 180°C. AS

51

[Flavour compounds of beer and their origin.]

Aromastoffe des Bieres und ihre Entstehung.

[Lecture]

Tressl, R.

Brauwelt 116 (39) 1252-1254, 1256-1259 (1976) [17 ref. De, en] [Forschungsinst. für Chem.-tech. Analyse, Versuchs- & Lehranstalt für Brauerei, Berlin (West)]

Aspects considered in this discussion of flavour compounds in beer include: analysis of flavour compounds by GLC; correlation of aroma and composition of GLC fractions; formation of flavour compounds during fermentation; formation of flavour compounds by Maillard reactions; and behaviour of flavour compounds from hops.

TUB-IGB

52

[Determination of aroma compounds in rum and other spirits by GLC-MS.] Beitrag zur Bestimmung von Aromakomponenten in Rum und anderen Branntweinen mit Hilfe der GC-MS-Analyse. Hunneman, D. H.; Gundermann, K.; Fuchs, H. *Branntweinwirtschaft* 116 (15) 269-272 (1976) [11 ref. De] [Physiol. Inst., Univ., Göttingen, Federal Republic of Germany]

4 ml of the spirit under examination are mixed with 0.5 g NaCl. 200 µl CS₂ are then added, and the mixture is shaken for 7 min. After holding in a refrigerator, the sample is centrifuged for 5 min at 3000 rev/min. Aroma compounds in the CS₂

extract are then separated and identified by GLC-MS. Interpretation of mass spectra is discussed, with reference to spectra for Jamaica rum samples and for various aroma compounds. TUB-IGB

53

The identification of two natural beverage components.

Kleipool, R. J. C.; Tas, A. C.; Straten, S. van *Lebensmittel-Wissenschaft und -Technologie* 9 (5) 296-298 (1976) [10 ref. En] [Cent. Inst. for Nutr. & Food Res. TNO, Utrechtsweg 48, Zeist, Netherlands]

1-(2,3,6-trimethylphenyl)-3-ethoxy-1-butene and 1-(2,3,6-trimethylphenyl)butadiene were identified as flavour constituents of rum and cognac. AS

54

[Methods of separating aromatic substances from fruit.]

Banev, B.

B'lgarski Plodove Zelenchutsi i Konservi No. 1, 7-10 (1974) [32 ref. Bg]

The aromatic substances are highly unstable and equipment used should not include metallic parts. Methods available (suitability varying with type of fruit) include: (i) gas chromatographic analysis of the atmosphere above a layer of fruit held 30-45 min in a sealed vessel, which is rapid, simple, avoids damage to the volatile and use of solvents, but is only qualitative due to dilution with air and water vapour; (ii) steam distillation at atm. pressure, which is simple but may decompose both volatile and non-volatile substances at 100°C and also introduces dilution with water vapour; damage to volatiles may be avoided by vacuum distillation; (iii) extraction with non-polar organic solvents; this may extract other substances e.g. fats, waxes, consumption of solvents (which may contain impurities) is high and biochemical changes may occur during the long procedure; (iv) air is passed through a bed of pulped fruit, the entrained volatiles are absorbed on activated C, then desorbed for examination by gas chromatography; this separates the volatiles in their original form, although the procedure is lengthy, complicated and slightly selective. STI

55

A comparison of methods for measuring the volatile components of apple fruits.

Knee, M.; Hatfield, S. G. S.

Journal of Food Technology 11 (5) 485-493 (1976) [8 ref. En] [East Malling Res. Sta., East Malling, Maidstone, Kent ME19 6BJ, UK]

Volatile compounds produced by apple fruits (*Malus domestica*, Borkh.) were separated and estimated by gas chromatography. Procedures were devised for estimation of compounds in air surrounding apples and discs of apple tissue, and in apple juice. Concn. of volatiles in air passing over apples were influenced by tissue permeability, concn. in peel or cortex, and the extent of enzymic

hydrolysis of esters passing through the peel. The complexity of these effects prevents assessment of the importance of compounds in apple flavour based on their concn. around whole fruit. The ratios of concn. established in air around cortical discs to concn. in juice were similar to air/water partition coeff. observed for standard compounds. Measurement of concn. above cortical discs is simple and sensitive and can be related to flavour, through the olfactory threshold concn. of the compounds detected. AS

56

Formation of flavor components in asparagus.

Tressl, R.; Holzer, M.; Kossa, T.

Abstracts of Papers, American Chemical Society 172, AGFD 152 (1976) [En] [Tech. Univ., Seestrassse 13, D-1000 Berlin (West) 65]

With the aid of liquid-liquid extraction, enriched aroma concentrates of asparagus were separated by adsorption chromatography into fractions of graduated polarity. Individual components were isolated by preparative gas chromatography and analysed by MS and gas chromatography. >100 constituents (including S-containing acids, aliphatic and aromatic acids, aldehydes, ketones, alcohols, phenols, pyrazines and pyrroles) were identified. Analysis of enzyme-inhibited aroma concentrates revealed that methyl-1,2-dithiolane-4-carboxylate and 1,2-dithiolane-4-carboxylic acid are principal constituents. During crushing, aldehydes, ketones and alcohols are produced by enzymatic splitting of linoleic and linolenic acids. Many flavour compounds are formed during heating. AS

57

[Studies of the volatile fatty acids and carbon dioxide produced in different kimchis.]

Chyun, J.-H.; Rhee, H.-S.

Korean Journal of Food Science and Technology 8 (2) 90-94 (1976) [18 ref. Ko, en] [Dep. of Food & Nutr., Coll. of Home Economics, Seoul Nat. Univ., Korea]

Kimchis (containing 100 g Chinese cabbage, 4 g green onion, 2 g garlic, 1 g ginger, 1 g sugar and 2 g red pepper) were prepared using different NaCl levels (1.02 and 3.16%) and different fermentation temp. (4-5 and 20-22°C) and a study made of their volatile fatty acid contents, CO₂ contents and organoleptic quality. Traces of formic acid were found in all samples; the acetic acid content ranged from 47.76 to 67.04 mg/100 g kimchi and the CO₂ content from 22.1 to 53.1 mg/100 ml brine. Taste panels scored kimchi containing 1.02% NaCl higher than that containing 3.16% NaCl and scored kimchi fermented at 4-5°C higher than that fermented at 20-22°C. [From En summ. and tables.] JA

58

A new strategy for the analysis of complex flavors.

Teitelbaum, C. L.

Abstracts of Papers, American Chemical Society 172, AGFD 153 (1976) [En] [General Foods

Corp., Tech. Cent., Tarrytown, New York 10591, USA]

The problem of isolating the components of very complex flavours can be solved by the sequential use of separation techniques in which each step uses a different set of physical properties to effect separation. Thus, one can successively use adsorption (silica gel chromatography), partition between 2 phases (normal or reversed phase partition chromatography) and vapour pressure (gas chromatography). An isolation scheme based on this concept is presented and its application to the analysis of cocoa butter demonstrated. AS

59

Steam distillation-solvent extraction recovery of volatiles from fats and oils.

Teranishi, R.; Murphy, E. L.; Mon, T. R.

Abstracts of Papers, American Chemical Society 172, AGFD 155 (1976) [En] [USDA, W. Regional Res. Cent., 800 Buchanan Street, Albany, California 94710, USA]

Steam distillation, sweeping with an inert gas and high vacuum distillation can be used to remove volatiles from lipids. In sweeping and vacuum distillation, low mol. wt. compounds are not totally condensed in cold traps, and higher mol. wt. compounds have much lower vapour pressures because of their inherent decreased vapour pressures and increased lipid solubility. Standard steam distillations present difficulties due to bumping of hot oil and extraction of small amounts of volatiles from large amounts of water. A spinning band column can be utilized to distribute the oil as a thin film, using steam to remove the volatiles and a modified Likens and Nickerson apparatus to extract the volatiles. Oil pumped through the system is stripped of volatiles by steam, and the volatiles can be simultaneously extracted in a very small vol. of solvent. This system is described in detail. AS

60

Determination of hydrogen sulfide in heated milks by gas-liquid chromatographic headspace analysis.

Thomas, E. L.; Reineccius, G. A.; DeWaard, G. J.; Slinkard, M. S.

Journal of Dairy Science 59 (11) 1865-1869 (1976) [9 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St Paul, Minnesota 55108, USA]

A gas-liquid chromatograph equipped with a flame photometric detector and a Teflon column containing 40/60 mesh Haloport-F treated with 12% polyphenyl ether and 0.5% orthophosphoric acid was used for H₂S analysis. Headspace sampling was accomplished by adding 10 ml of water to the milk sample, forcing headspace vapours into a 6-port sampling valve attached to the chromatograph. A 1-ml vapour sample was flushed into the column for analysis. As little as 10 µg of H₂S/ml milk were detected. Instrumental responses were compared to sensory evaluation of several heated milk samples. A correlation was established between H₂S in milk

headspace and the degree of cooked flavour determined organoleptically. AS

61

Production of volatile flavor compounds in ultra-high-temperature processed milk during aseptic storage.

Jeon, I. J.; Thomas, E. L.; Reineccius, G. A. *Abstracts of Papers, American Chemical Society* 172, AGFD 157 (1976) [En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St. Paul, Minnesota 55108, USA]

The UHT milk was processed at 145°C for 3 s with and without added ascorbic acid and stored at 3°, 22° and 35°C for 5 months. Flavour isolates were prepared through steam vacuum distillation and subsequent extraction of the distillate with dichloromethane, and analysed on a 3 m × 0.32 cm 10% Carbowax 20 M column coupled to a mass spectrometer. Acetone, 2-pentanone, 2-heptanone, 2-nonanone and n-hexanal contents increased during storage. Considerable increases were also observed with 2-octanone, 2-undecanone, 2-tridecanone, n-propanal, n-pentanal, n-heptanal, n-octanal and n-nonanal. The quantities of some of these compounds formed depended upon both O₂ content and temp. of storage. Alcohols such as 1-propanol, 1-butanol, 1-pentanol, 1-heptanol were present but only 1-butanol showed an increase during storage. Other compounds such as diacetyl, 2-decanone, n-decanal, benzene, toluene, ethylbenzene, 2-furfural, benzaldehyde, 2-furfural, methyl sulphide and methyl disulphide were present but did not increase during storage. AS

62

Volatile compounds in butter oil. V. The quantitative estimation of phenol, o-methoxyphenol, m- and p-cresol, indole and skatole by cold-finger molecular distillation.

Stark, W.; Urbach, G.; Hamilton, J. S. *Journal of Dairy Research* 43 (3) 479-489 (1976) [13 ref. En] [Dairy Res. Lab., Div. of Food Res., CSIRO, PO Box 20, Highett, Victoria 3190, Australia]

Phenol, o-methoxyphenol, m- and p-cresol, indole and skatole have been isolated from good quality butter oil by cold-finger molecular distillation, and separated into phenolic and indolic fractions by solvent extraction and silicic-acid column chromatography. The individual compounds were quantitatively estimated by GLC. When phenol, o-methoxyphenol, m- and p-cresol, indole and skatole were added to volatile-free butter oil, their recoveries were 94, 47, 90, 75, 71 and 61% respectively. The technique, when applied to fresh butter oil, gave the following ranges of values for the natural levels of these compounds: phenol 0.005-0.022, o-methoxyphenol 0.002-0.10 m-cresol 0.002-0.010, p-cresol 0.002-0.004, indole 0.07-0.13, skatole 0.16-0.22 ppm of butter oil. The results, when compared with flavour threshold studies, showed that indole and skatole are

important contributors to the natural flavour of butter oil, but that phenolic compounds are of borderline significance. [See preceding abstr. for part IV.] AS

63

[Amines in the volatile components of Salmon.]

Zhuravleva, I. L.; Golovnya, R. V. *Prikladnaya Biokhimiya i Mikrobiologiya* 12 (5) 788-791 (1976) [11 ref. Ru, en] [Inst. of Elemento-Organic Compounds, USSR Acad. of Sci., USSR]

The composition of organic bases in the volatile aroma components of slightly salted fillet of *Salmo salar* L. is described. Using gas chromatography, 20 amines were detected; 18 were identified, 4 of them only tentatively. Differences in the qualitative composition and quantitative proportion of amines in the aroma-forming components of salmon, salmon roe and sturgeon caviare were found. AS

64

Identification of neutral and basic flavor compounds in fermented fish sauce.

Brooks, R. I.; Reineccius, G. A. *Abstracts of Papers, American Chemical Society* 172, AGFD 158 (1976) [En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St. Paul, Minnesota 55108, USA]

Traditional methods of producing fish sauce involve several months of fermentation. Several attempts have been made to accelerate the process but products obtained by accelerated techniques generally have a poor flavour. An attempt was made to identify the volatile neutral and basic flavour compounds of traditionally produced Southeast Asian fish sauce. Neutral and basic fractions were isolated by direct solvent extraction with dichloromethane. Both fractions were analysed by gas chromatography and MS using Carbowax 20M columns. Analysis also included splitting the column effluent and sniffing components as they eluted from the column. Methylamine, dimethylamine, trimethylamine, 2-methyl pyrazine, 2,5-dimethyl pyrazine, hydroxyvaleric acid lactone and phenol have been identified to date. Lactones quantitatively dominated the flavour profiles, accounting for >75% of the volatiles in the combined neutral and basic fractions. AS

65

Volatiles produced by microorganisms isolated from refrigerated chicken at spoilage.

Freeman, L. R.; Silverman, G. J.; Angelini, P.; Merritt, C., Jr.; Esselen, W. B. *Applied and Environmental Microbiology* 32 (2) 222-231 (1976) [31 ref. En] [Food Sci. Lab., US Army Natick Res. & Development Command, Natick, Massachusetts 01760, USA]

Fresh deboned chicken breasts (irradiated at 0.25 Mrad or non-irradiated) were stored under

aerobic or anaerobic conditions at 2° or 10°C until spoilage took place. Headspace volatiles of the spoiled chicken samples were identified by high-vacuum low-temp. distillation followed by GLC-MS. Microorganisms from the spoiled samples were isolated, and identified; their capacity to produce volatiles on sterile chicken breast samples was studied. Tables of results are given. 22 volatile compounds were associated with spoilage; the effects of irradiation, storage temp. and aerobic vs. anaerobic storage on volatiles formation are discussed. *Pseudomonas* spp. predominated. *Microbacterium thermosphactum*, *Lactobacillus* sp., *Moraxella* spp., *Acinetobacter* sp. and *Flavobacterium* spp. were also isolated. Some strains of *Pseudomonas*, *Moraxella* and *Flavobacterium* produced volatiles typical of spoiled chicken. AJDW

66

Aqueous flavor precursors. Free nitrogenous compounds, sugars and organic acids in red meats. Mabrouk, A. F.; Holmes, L. G.

Abstracts of Papers, American Chemical Society 172, AGFD 159 (1976) [En] [Food Sci. Lab., US Army Res. & Development Command, Natick, Massachusetts 01760, USA]

Red meats owe their characteristic flavours to complex blends of amino compounds, peptides, glycopeptides, nucleotides, nucleotide derivatives, sugars and organic acids (e.g. phosphoserine, phosphoethanolamine, taurine, urea, aspartic acid, threonine, serine, asparagine, proline, glutamic acid, glycine, alanine, valine, methionine, leucine, isoleucine, tyrosine, phenylalanine, ornithine, lysine, 1-methyl histidine, histidine, tryptophan, carnosine, arginine, inosine-5-monophosphate, adenosine-5-monophosphate, guanosine-5-monophosphate, cytidine-5-monophosphate, uridine-5-monophosphate, lactic acid, succinic acid, glycollic acid, glucose, fructose, ribose, inositol). The concn. of the individual compounds varies according to the animal species. AS

67

GC-MS identification of the volatile compounds extracted from roasted turkeys fed a basal diet supplemented with tuna oil: some comments on fishy flavor.

Crawford, L.; Kretsch, M. J.

Journal of Food Science 41 (6) 1470-1478 (1976) [23 ref. En] [USDA, W. Regional Res. Lab., Berkeley, California 94710, USA]

This paper reports the GLC-MS identification of many of the compounds found in the volatiles of roasted turkeys that had been fed a basal diet supplemented with beef fat or with tuna oil or with tuna oil plus α -tocopherol acetate and present a case for which of these 41 compounds are likely to play a role in fishy flavour development in turkey meat. IFT

68

[Strains of microorganisms for curing of meat products. V. Formation of volatile compounds during cooking of pork cured in pickles containing selected microorganisms.]

Teruya, K.; Kako, Y.; Akashi, A.; Kojima, M. **Japanese Journal of Dairy and Food Science [Rakuno Kagaku Shokuhin no Kenkyu]** 25 (5) A157-A162 (1976) [6 ref. Ja, en] [Yayoi Shokuhin Co., Fukuoka Branch, Fukuoka, Japan]

Ham muscle cubes were cured for 1 wk at 4°C in brines (10% NaCl, 0.03% NaNO₂, 1.5% sodium polyphosphate, 5% sucrose, 1% meat extract and 0.3% yeast extract) containing (i) no added microorganisms; (ii) *Achromobacter* sp. plus *Pediococcus* sp.; or (iii) *Pseudomonas* sp. + a yeast. The cured ham samples were cooked at 75°C for 60 min in an airtight bag. The cooked samples were then minced and mixed with an equal vol. of water; volatile carbonyl compounds were separated by bubbling N₂ through the mixture at 98°C for 8 h, and the carbonyl compounds were collected as the appropriate dinitrophenylhydrazones and analysed by GLC. A table of results is given. Both (ii) and (iii) gave reduced concn. of formaldehyde, acetone + propionaldehyde, n-valeraldehyde and 2-heptanone, and increased concn. of acetaldehyde and 3-pentanone as compared to (i). Implications for the flavour of the ham are discussed, and the potential value of these microorganisms in ham curing is considered. [From En summ.] AJDW

69

[Examination of the oil from leaves of *Psidium guajava* L. var. *Safeda*.] Untersuchung des Guajavenblätteröles der *Psidium guajava* L.-Varietät.

Chandra, V.; Sharma, M. L.; Raina, R. M.; Singh, A.

Riechstoffe, Aromen, Koerperpflegemittel 26 (7) 136-137 (1976) [6 ref. De, en] [Nat. Botanic Gardens, Lucknow, India]

The leaves of *P. guajava* L. var. *Safeda*, which are used as an astringent drink and for flavouring, were subjected to wet distillation. 0.5% of a pale yellow, weakly aromatic essential oil were obtained (fresh wt. basis) and examined for physico-chemical properties and chemical composition. GLC and conventional analysis revealed the presence of 0.99% myrcene, 8.01% d-limonene, 2.7% 1,8-cineol, 7.7% caryophyllene, 37.5% caryophyllene oxide and 13.0% eugenol. RM

70

[Study on the constituents and infrared spectra of clove oils.]

Ono, Y.; Tanaka, S.

Japan Analyst [Bunseki Kagaku] 25 (7) 478-480 (1976) [11 ref. Ja, en] [Cent. Customs Lab., Min. of Finance 531 Iwase, Matsudo-shi, Chiba, Japan]

The constituents of several imported clove oils

(*Eugenia caryophyllata* Thumb.) were examined to distinguish differences in IR absorption intensity at 1765 cm^{-1} . Alkali extraction with N NaOH effectively separated eugenol, the main component, from an ether solution. Non-phenolic fractions were examined by MS-GLC. Identification of oxygenated compounds in the ether fraction revealed that differences in intensity of absorption were due to eugenol acetate concn. RM

71

[The essential oil of *Persea americana* Miller, var. *drymifolia*.]

Iglesias, D. I. A. de; Viana, M. E. L. de; Retamar, J. A.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 58 (3) 158-159 (1976) [6 ref. Es, it, fr, en, de] [Fac. de Bioquímica, Química y Farmacia, Univ. Nacional de Tucuman, Argentina]

The plant was subjected to steam distillation, giving an essential oil yield of 3.1%. The oil was found to consist of 0.09% fatty acids and 0.17% phenols. Chromatography and IR spectroscopy of the remaining constituents showed the main component (approx. 90%) to be oestragole (methyl chavicol), with approx. 5% anethole. HBr

72

[The essential oil of *Coronopus didymus* Linnaeus.]

Iglesias, D. I. A. de; Viana, M. E. L. de; Retamar, J. A.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 58 (3) 150-151 (1976) [8 ref. Es, it, fr, en, de] [Fac. de Bioquímica, Química y Farmacia, Univ. Nacional de Tucuman, Argentina]

The whole plant was subjected to steam distillation and extracted with ether. The ether extract was dried with anhydrous magnesium sulphate to obtain the essential oil (yield, 0.11%). Gas chromatographic analysis showed the main constituent to be benzyl cyanide. HBr

73

Volatile degradation products of L-dehydroascorbic acid.

Velisek, J.; Davidek, J.; Kubelka, V.; Zelinkova, Z.; Pokorny, J.

Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 162 (3) 285-290 (1976) [33 ref. En, de] [Dep. of Food Chem. & Analysis, Inst. of Chem. Tech., CS-16628 Prague-6, Czechoslovakia]

Volatile degradation products were isolated from solutions of L-dehydroascorbic acid in phosphate buffer solutions of pH 2, 4, 6 and 8 which had been heated under reflux for 3 h or left at 25°C for 200 h. The products were identified by comparison of their gas chromatographic retention data, and IR and mass spectra with those of authentic compounds. 15 products were identified; of these, 12 had not been previously reported as degradation

products of L-dehydroascorbic acid. Concn. of the 9 main degradation products, i.e. 3-hydroxy-2-pyrone, 2-furancarboxylic acid, 2-furaldehyde, acetic acid and 2-acetylfuran, depended on pH and temp.; the presence of O_2 had no pronounced effect. AS

74

Trace analysis of 3-hydroxy-1-nitrosopyrrolidine, a non-volatile N-nitrosamine, by combined gas chromatographic-mass spectrometric method. Sen, N. P.; Miles, W. F.; Seaman, S.; Lawrence, J. F.

Journal of Chromatography 128 (1) 169-173 (1976) [21 ref. En] [Food Res. Div., Health Protection Branch, Ottawa K1A 012, Canada]

A highly specific gas chromatographic-MS technique is described in which 3-hydroxy-1-nitrosopyrrolidine (HNP) is determined at ng quantities after conversion to a stable volatile derivative, 3-methoxy-1-nitrosopyrrolidine (MNP). This is claimed to be the first successful method reported for analysis of HNP. The methylated ether derivative is easy to prepare, and the product is stable and volatile enough to undergo the vacuum distillation clean-up process. It is hoped that the technique will be useful for trace analysis of HNP in foods, etc. It is thought that traces of HNP may be produced during cooking of bacon or other cured meat products, but due to the lack of suitable analytical methods it has not yet been substantiated. AL

75

[Analysis of aroma compounds in foods. II. Separation of carbonyl compounds from aroma compound mixtures, using vanillin and ethylvanillin as examples; gas chromatographic and mass spectrometric identification of vanillin and ethylvanillin as trimethylsilyl ethers.] Zur Analyse von Aromastoffen in Lebensmitteln. II. Die Abtrennung von Carbonylverbindungen aus Aromastoffgemischen am Beispiel Vanillin, Äthylvanillin; Gaschromatographische Trennung und massenspektrometrische Identifizierung von Vanillin und Äthylvanillin als TMS-Äther. Braun, G.; Hieke, E.

Deutsche Lebensmittel-Rundschau 72 (11) 393-394 (1976) [1 ref. De, en, fr] [Chem. Untersuchungsamt, 65 Mainz, Federal Republic of Germany]

A method for detn. of carbonyl compounds (e.g. vanillin, ethylvanillin) in complex mixtures of volatile aroma compounds is described. Volatiles are extracted with diethyl ether; $\text{Na}_2\text{S}_2\text{O}_5$ is then added, and carbonyl compounds are extracted into water as the appropriate pyrosulphite addition compounds. The extract is then acidified to liberate the carbonyl compounds, which are extracted with diethyl ether, silylated with N-methyl-N-trimethylsilyltri-fluoroacetamide, separated by GLC (on a nitrile silicone oil XE60/Chromosorb G column), and identified by MS. [See FSTA (1974) 66T333 for part I.] AJDW

76

[Influence of the conditions of freeze-drying on the volatile components and organoleptic characteristics of soluble coffee.]

Colombo, A. J.; Aquarone, E.; Baruffaldi, R. *Revista Brasileira de Tecnologia* 6 (1) 17-25 (1975) [14 ref. Pt, en] [Dep. de Tecnologia Bioquimico-Farmaceutica, Fac. de Ciencias Farmaceuticas, Univ. de Sao Paulo, Sao Paulo, Brazil]

Experiments were carried out on a commercial coffee extract, which was freeze-dried to produce a commercial coffee, and on a filter extract obtained from ground beans, which was freeze-dried to produce a filter coffee. Freeze-drying was to final extract concn. of 8°, 12° and 16° Brix, in each case to final temp. of 30°, 60° and 90° C; the freeze-drying process was repeated, to give 2 sets of samples of each product (9 samples/set). The moisture content of the samples was determined, and the areas under gas chromatograms were compared to study the effect on the volatile constituents; additionally, organoleptic tests were carried out. Tabulated results showed that the samples freeze-dried to a final temp. of 30° C had the highest moisture content; the largest gas chromatogram areas were obtained with samples freeze-dried to 60° C; these (60° C) samples received the highest organoleptic scores; and the final extract concn. did not have a significant effect. HBr

77

Procedure for non-destructive concentration of flavour-active components of beer.

Pickett, J. A.; Coates, J.; Sharpe, F. R. *Journal of the Institute of Brewing* 82 (4) 228-232 (1976) [20 ref. En] [Brewing Ind. Res. Foundation, Nutfield, Redhill, Surrey, UK]

New methods for the isolation and concn. of beer volatiles are described. Components with higher and lower volatility are treated separately. More highly volatile components are separated by vacuum distillation at low temp. (below -46° C) in a closed system. The resulting concentrates are conveniently stored in specially constructed ampoules. Beer components with low volatility are isolated by steam distillation of beer at < 20° C under vacuum, followed by solvent extraction of the distillate. Solvent is removed at 0° C and the concentrate stored in ampoules. Both procedures avoid contamination during isolation and concn. and also avoid thermolysis or oxidation of components. The concentrates are obtained in a form particularly suitable for examination by gas chromatography and gas chromatography coupled with MS. AS

78

Identification of volatile compounds in hybrids between raspberry (*Rubus idaeus* L.) and arctic bramble (*Rubus arcticus* L.).

Pyysalo, T.

Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 162 (3) 263-272 (1976) [21 ref. En, de] [Tech. Res. Cent. of Finland, Food Res. Lab., SF-02150 Espoo 15, Finland]

A study was made of the volatile aroma compounds in raspberry (var. Ottawa), in wild and cultivated arctic bramble var. and in 5 hybrids of raspberry × arctic bramble. Carbonyl compounds were determined as 2,4-dinitrophenylhydrazones, and the volatile acids and neutral components separately in a combined gas chromatograph-mass spectrometer using glass capillary columns. > 70 compounds were identified in the aroma concentrates of the hybrids. The major components included acetic and hexanoic acids, trans 3-penten-1-ol, 2-heptanol, 3-methyl-2-buten-1-ol, benzyl alcohol and linalool. 2,5-dimethyl-4-methoxy-2,3-dihydro-3-furanone, which has been identified as the major aroma compound of arctic bramble [FSTA (1976) 8 9J1435], was positively identified in only 2 of the hybrids and at a concn. much lower than that in arctic bramble, 0.02-0.08 ppm vs. 7-18 ppm. Volatile acids constituted 50-68% of the total volatiles in the hybrids, but their effect on aroma was almost insignificant. [See also FSTA (1976) 8 10J1638.] JA

79

[Aroma compounds.]

Muller, D.

Bios 7 (5) 10-13 (1976) [Fr]

Following a discussion of the occurrence of natural aroma compounds in foods, of conventional and legal definitions of aroma compounds, and of aromatization, consideration is given to the production of various aroma-containing products from strawberries, e.g. alcoholic distillates, infusions, puree and pulps, conc. juice, powders. Use of strawberry aroma products is briefly discussed with reference to technological, legislative and organoleptic aspects. JA

80

Submerged cultivation of morel mushroom mycelium in waste sulfite liquors.

Duy, A. le

Dissertation Abstracts International, B 37 (3) 1352-1353 (1976) [En] [Univ. of W. Ontario, London, Ontario, Canada]

4 spp. of morels (*Morchella crassipes*, *M. deliciosa*, *M. esculenta*, *Morchella* spp.) were cultivated on various waste sulphite liquor (WSL) media. Conc. WSL completely inhibited growth; optimum dilution ratio for both mycelial growth and yield was approx. 1:5 v/v. Growth generally occurred in large pellet form in shake flasks but in dispersed form in fermentors. Freeze-dried morel mycelium contained (Dm basis) 23.2-48.0% crude protein, 2.45-4.38% fat, 13.7-39.2% carbohydrate and 5.9-18.0% ash. The essential amino acid spectrum was comparable to the FAO standard, except for methionine and isoleucine. Essential fatty acids, e.g. linoleic and linolenic acids, were

present. Freeze-dried powdered samples had a strong mushroom flavour. Flavour concentrates of freeze-dried mycelia contained ketones, aldehydes, alcohols, phenols and esters. JA

81

Analysis of leek volatiles by headspace condensation.

Schreyen, L.; Dirinck, P.; Wassenhove, F. van; Schamp, N

Journal of Agricultural and Food Chemistry 24 (6) 1147-1152 (1976) [6 ref. En] [Dep. of Organic Chem., State Univ. of Ghent, B-9000 Ghent, Belgium]

The flavour complex of freshly harvested leek (*Allium porrum* L.) was studied by a combination of capillary gas chromatography and MS. Headspace condensation was used for isolation of the volatile flavour components. Possibilities and difficulties of the new isolation technique were examined. Odour properties were evaluated by running aromagrams on a thermal conductivity detector. The described method is very mild and produces a high quality flavour extract. This extract was compared with the essential oil obtained by steam distillation of leek. AS

82

Improvement of the direct GC analysis of vegetable oils' volatile profile by a poly MPE-Tenax GC column.

Williams, J. L.; Wille, J. H.

Journal of the American Oil Chemists' Society 53 (10) 634-635 (1976) [4 ref. En] [Kraftco Corp. R & D, Glenview, Illinois 60025, USA]

A Poly MPE-Tenax column has been successfully incorporated in Dupuy's method of direct GC analysis of volatiles in vegetable oils. This column provided a considerable reduction in column bleed, speed of analysis, and improved adsorptivity of volatiles, quantitation, and consistency of integrator counts. AS

83

Correlations of flavor score with volatiles of vegetable oils.

Dupuy, H. P.; Rayner, E. T.; Wadsworth, J. I.

Journal of the American Oil Chemists' Society 53 (10) 628-631 (1976) [4 ref. En] [S. Regional Res. Cent., Agric. Res. Service, USDA, PO Box 19687, New Orleans, Louisiana 70179, USA]

A simple direct, gas chromatograph (GC) technique is described for eluting flavour-related volatile components from commercially produced vegetable oils. A sample of oil was placed onto glass wool contained in a GC liner, and the liner was inserted in the heated inlet of the GC. Volatiles from the oils were rapidly eluted by heat and carrier gas onto the GC column. Profiles of the volatiles were obtained by temp.-programmed gas chromatography. Flavour score was highly correlated with individual volatile components considered separately, and very highly correlated

with multiple volatile components considered together, indicating that reliable flavour characteristics of vegetable oils may be obtained rapidly and efficiently by instrumentation. AS

84

[Natural chicken flavour preparation.]

Hühnerfleischaroma. Geschmack wie aus Mutters Küche.

Salzer, U. J.

Ernährungswirtschaft No. 6, 306, 308-310

(1976) [De] [Haarmann & Reimer GmbH, Abteilung Aromen-Entwicklung, Holzminden, Federal Republic of Germany]

A process for manufacture of a natural chicken flavour is described. After a special treatment (resembling ripening) of the meat, the aroma is extracted, conc., absorbed on a suitable carrier material, and dried. Advantages claimed for this product include intense chicken flavour, good storage properties, uniform quality, low price, and legal status as a 'natural' product. Applications include flavouring of protein preparations of vegetable origin, and use in soups and sauces. IN

85

[Food aroma components. III.] Aroma-Lebensmittelbestandteile. III.

Bajaj, K. L.; Bhatia, I. S.

Riechstoffe, Aromen, Koerperpflegemittel 26 (8) 158-159 (1976) [De] [Biochem. Dep., Tocklai Exp. Sta., Jorhat 785008, Assam, India]

The series of papers is continued with a survey of isoprenoid aroma compounds, mainly terpenes. [See FSTA (1976) 8 7A353 for part II.] RM

86

Simultaneous detection of nitrogen and sulfur containing flavor volatiles. (In 'Phenolic, sulfur, and nitrogen compounds in food flavors' [see FSTA (1977) 9 5T271].) [Lecture]

Withycombe, D. A.; Walradt, J. P.; Hruza, A. pp. 85-95 (1976) [12 ref. En] [Int. Flavors & Fragrances Inc., 1515 Highway 36, Union Beach, New Jersey 07735, USA]

A chromatographic system which utilizes a flame photometric detector (FPD) and an alkali flame ionization detector (AFID) in addition to the flame ionization detector (FID) for analysis of S- and N-containing compounds is described in detail. This inert, high capacity, high resolution chromatographic system permits simultaneous flame ionization of N and S components having low odour thresholds and their simultaneous physiological detection, which provide max. information for the collection and interpretation of gas chromatographic-MS data. A chromatogram of a conc. ether solution of cooked pork liver volatiles is given, together with a computer regenerated total ion chromatogram of the GC-MS analysis with specific ion plots for 4 specific masses (111, 81, 47 and 95). AL

87

Misleading information from odour evaluation of gas chromatographic effluents in aroma analysis. Williams, A. A.; Tucknott, O. G.

Chemistry and Industry No. 3, 125 (1977) [7 ref. En] [Cider & Fruit Juices Sect., Long Ashton Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

Examination of a strawberry extract and a synthetic cider aroma concentrate by odour evaluation of gas chromatographic effluents is reported. It appears that under certain conditions major components can be contaminated with others of widely differing retention times, which, if they possess, either alone or by synergism, more significant odours than the major component will give the impression that the latter is an important character-imparting component, although in fact it may be virtually odourless. Reasons for the co-elution are uncertain. AL

88

[Breakdown of linoleic and linolenic acid hydroperoxides in the presence of ascorbic acid. Analysis of the volatile aldehydes.] Abbau von

Linol- und Linolensäurehydroperoxyden in Gegenwart von Ascorbinsäure. Analyse der flüchtigen Aldehyde.

Grosch, W.

Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 163 (1) 4-7 (1977) [23 ref. De, en]

[Deutsche Forschungsanstalt für Lebensmittelchemie, Leopoldstrasse 175, D-8000 Munich 40, Federal Republic of Germany]

Hydroperoxide emulsions containing 10^{-3} mol ascorbic acid were stored for 19 h at 22°C. Volatile aldehydes were formed in the presence of O_2 and traces of metals. The principal compounds were identified as 2-pentenal and 2-hexenal from 13-hydroperoxioctadeca-9,11,15-trienoic acid; propanol and 2-hexenal from 9-hydroperoxioctadeca-10,12,15-trienoic acid; and hexenal from 13-hydroperoxioctadeca-9,11- and 9-hydroperoxioctadeca-10,12-dienoic acid. C9 and C10 aldehydes were detected in very low concn. as fragments of the 9-hydroperoxides. AS

89

Aroma of sherry wines. [Lecture]

Webb, A. D.; Noble, A. C.

Biotechnology and Bioengineering 18 (7) 939-952 (1976) [20 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

> 130 volatile components have been identified in aromas of film (F), submerged-culture flor (S), and baked (B) sherries. The composition of these volatiles, which include > 25 alcohols, 5 carbonyls, 10 acetals, 3 amides, 35 esters, and 5 lactones, is influenced by the var. of grape used, the nature of the primary alcoholic fermentation, type of cooperage, ageing and blending system, and film-phase yeast metabolism in F and S or reactions

occurring during 'baking' in B. The influence of these factors on the aroma and several volatile formation mechanisms which contribute to the characteristic flavour of sherry, particularly during the film growth and during baking, are discussed. AS

90

[Essential oils utilized in the manufacture of soft drinks.]

Tarral, L.

Bios 7 (10) 3-6 (1976) [Fr] [Soc. des Matieres Aromatiques Daniel Blayn, 60-62 Avenue General-Leclerc, 94702 Maisons-Alfort, France]

Topics discussed in this review-type paper are: extraction of essential oils from citrus fruit; composition of essential oils; treatment of essential oils (rectification, concentration, deterpenation, desesquiterpenation, cold deterpenation); and countries of origin of essential oils (lemon, sweet orange, bitter orange, mandarin, grapefruit, sweet lime, mint, aniseed) and amounts produced. JA

91

[Quantitative gas chromatographic determination of organic acids, neutral substances (carbohydrates) and amino acids in wort and beer.] Quantitative gaschromatographische Bestimmung von organischen Säuren, Neutralstoffen (Kohlenhydraten) und Aminosäuren in Würze und Bier.

Drawert, F.; Leupold, G.; Lessing, V.

Brauwissenschaft 29 (11) 345-353 (1976) [83 ref. De, en, fr] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, 8050 Freising-Weißenstephan, Federal Republic of Germany]

GLC methods (using 8 different columns) are described for detn. of amino acids, carbohydrates and organic acids (of limited volatility) in worts and beers. 28 amino acids may be determined as their trimethylsilyl or N-trifluoroacetyl n-butyl ester derivatives; 25 other organic acids may be determined as their trimethylsilyl (or in the case of keto acids, their methoxime-trimethylsilyl) derivatives. 26 carbohydrates and related compounds may be determined as trimethylsilyl derivatives (pentoses and deoxyhexoses being reduced to alcohols, then determined as the corresponding trimethylsilylpentitols or trimethylsilyldeoxypentitols). Tables of data are given for these constituents in various types of beer. TUB-IGB

92

The influence of heat on the aroma of cloudbberries (*Rubus chamaemorus* L.).

Pyysalo, T.; Honkanen, E.

Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 163 (1) 25-30 (1977) [22 ref. En, de] [Food Res. Lab., Tech. Res. Cent. of Finland, SF-02150 Espoo 15, Finland]

Qualitative and quantitative differences between the volatiles of fresh and heated cloudberry were evaluated and the significance of the differences

calculated. 14 new volatile were identified, including vanillin, methyl vanillate, acetovanillone and 3,5-dihydroxy-2-methyl-4H-pyran-4-one. During heating, 2 additional compounds, 3-hydroxypyran-2-one and 2-pyrrolaldehyde, were formed. Comparison of quantitative data for heated and unheated samples revealed 21 compounds having significant differences in concn. at or below the 10% level. The concn. of 4-vinylphenol, 2-methoxy-5-vinylphenol, furfural, 5-hydroxymethylfurfural and 3,5-dihydroxy-2-methyl-4H-pyran-4-one increased very markedly on heating. The concn. of 81 compounds in the unheated press juice of cloudberry are given. [See also FSTA (1976) 8 9J1436.] AS

93

Alkylpyrazines in processed American cheese.
Lin, S. S.

Journal of Agricultural and Food Chemistry 24 (6) 1252-1254 (1976) [14 ref. En] [Anderson Clayton Foods, Richardson, Texas 75080, USA]

The volatile flavour components of a processed American cheese were analysed by an adsorption-desorption gas chromatographic technique, and identified by a combination of GLC-MS, GLC retention time, and odour at GLC exit port. 2,5-dimethylpyrazine and 2,3,5-trimethylpyrazine were identified in addition to alcohols, methyl ketones, esters, alkylbenzenes, lactones, aldehydes, and volatile acids commonly present in cheese. The pyrazines are believed to be the main contributor to the weak nutty notes detected in processed American cheese. AS

94

Artefact production in the Likens-Nickerson apparatus when used to extract the volatile flavourous components of cod.

McGill, A. S.; Hardy, R.

Journal of the Science of Food and Agriculture 28 (1) 89-92 (1977) [4 ref. En] [Torry Res. Sta., Aberdeen, UK]

An investigation currently being conducted into the flavour volatiles present in cold-stored cod (*Gadus morhua*) indicated that the use of the Likens-Nickerson apparatus [Proceedings. American Society of Brewing Chemists (1964) p. 5] for their extraction gives rise to artefacts. The artefacts, which are produced by oxidation of the lipids, can be minimized or suppressed by the use of antioxidants and carrying out the extraction in the absence of O₂. AS

95

Flavor precursors in food stuffs. (In 'Phenolic, sulphur, and nitrogen compounds in food flavors' [see FSTA (1977) 9 5T271].) [Lecture]

Schutze, L.

pp. 96-113 (1976) [11 ref. En] [UniMills BV,

Lindendijk 8, Zwijndrecht, Netherlands]

Taste and odour compounds and their precursors in food systems are discussed, with particular reference to meat flavour compounds and their application in processed meat products and vegetable protein products. AL

96

Pyrazines in the reaction of L-dehydroascorbic acid with ammonia and glycine.

Davidek, J.; Velisek, J.; Zelinkova, Z.; Kubelka, V. *Journal of Food Science* 42 (1) 277-278 (1977) [13 ref. En] [Dep. of Food Chem. & Analysis, Inst. of Chem. Tech., 166 28 Prague 6, Czechoslovakia]

Volatile reaction products of L-dehydroascorbic acid with NH₃ and glycine were isolated from alkaline solutions, separated by GLC and identified by comparison of their gas chromatographic retention and mass spectral data with those of authentic compounds. 5 alkylpyrazines were positively identified: methyl-; 2,5-dimethyl-; trimethyl-; 2,5-dimethyl-3-ethyl-; and tetramethylpyrazine. _ IFT

97

A study of the volatiles isolated from a D-glucose-hydrogen sulfide-ammonia model system.

Shibamoto, T.; Russell, G. F.

Journal of Agricultural and Food Chemistry 25 (1) 109-112 (1977) [32 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

The compounds produced by heating a D-glucose-hydrogen sulphide-ammonia-water model system were extracted with methylene chloride using a liquid-liquid continuous extractor. 51 compounds were identified by a combination of gas chromatographic and MS techniques. The main constituents of the reaction mixtures were thiophenes, furans, pyrazines, and thiazoles. With small amounts of ammonia in the starting mixture, the reaction products consisted mainly of thiophenes and furans and possessed a somewhat sulphury aroma which was also akin to that of rare cooked meat. When the amount of ammonia was increased, however, the reaction mixture contained a large proportion of pyrazines, a smaller proportion of thiazoles, thiophenes and furans and the mixture possessed a nutty or burnt aroma. [See also FSTA (1976) 8 12A686 & 12S2096.] AS

98

Formation of sulfur- and nitrogen-containing compounds from the reaction of furfural with hydrogen sulfide and ammonia.

Shibamoto, T.

Journal of Agricultural and Food Chemistry 25 (1) 206-208 (1977) [20 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

17 compounds produced from the reaction of furfural, hydrogen sulphide and ammonia in aqueous solution under cooking conditions were identified by a gas chromatography-MS technique. Major reaction products were cyclic methylene polysulphides and furan derivatives. The formation of oxazole and pyrazine derivatives indicated that furfural produced a smaller number of C units. The formation of thiophene and pyrrole derivatives indicated that the O atom in the furan ring exchanged with the S and N atoms. In addition to those compounds, 2 self-condensation products of furfural, difuryl ethylene and furil, were obtained in large amounts from this reaction. AS

99

Food flavour - the present and future possibilities.

[Review]

Forss, D. A.

Food Technology in New Zealand 11 (9) 22-23; (10) 38-39, 41, 43 (1976) [44 ref. En] [Invermay Agric. Res. Cent., Min. of Agric. & Fisheries, Mosgiel, New Zealand]

A comprehensive review of flavour chemistry, particularly its history in recent years, is presented. Flavour perception is briefly discussed, with consideration of some of the classification systems used to categorise odours and flavours. Duplication of natural flavours by empirical techniques, and the methods now used to identify natural flavour chemicals are described, particularly gas chromatography and mass spectrometry. The formation of natural flavours, either enzymically or during processing, and future trends in flavouring technology are discussed, with reference to the production of new artificial flavours. JRR

100

Volatile composition of McIntosh apple juice as a function of maturity and ripeness indices.

Sapers, G. M.; Abbott, J.; Massie, D.; Watada, A.; Finney, E. E., Jr.

Journal of Food Science 42 (1) 44-47 (1977) [24 ref. En] [USDA, E. Regional Res. Cent., Philadelphia, Pennsylvania 19118, USA]

Research was undertaken to establish relationships between volatile levels in the juice of fresh apples, determined by GLC headspace vapour analysis, and other objective indices of maturity and ripeness. McIntosh apples were tested individually after harvest or following storage and ripening. Volatile levels in the juice were correlated with titratable acidity, Magness-Taylor firmness and stiffness coeff. values. The stiffness coeff. is derived from nondestructive sonic resonance frequency measurements and has potential value for sorting. IFT

101

[Effects of fermentation conditions of formation of volatile compounds in beer.] Einfluss der

Gärbedingungen auf die Bildung der flüchtigen Substanzen des Bieres.

Gaeng, F. E.

Brauwissenschaft 29 (11) 337-344 (1976) [10 ref. De, en, fr]

Studies on formation and loss of volatile compounds at various stages of beer manufacture (primary fermentation, warm storage, CO₂-flushing, cold storage, maturation) are described; tables of data are given for beer characteristics (pH, temp., extract content, suspended yeast content, and concn. of various volatiles) at the process stages studied. Effects of initial temp. during primary fermentation were also studied. The results are discussed in detail. It is concluded that low initial temp. during fermentation are desirable, to avoid excessive formation of volatiles. Temp. may, however, be allowed to increase towards the end of the fermentation stage of the process. CO₂-flushing is highly effective for elimination of dimethyl sulphide and other S compounds, and thus for improvement of flavour stability. AJDW

102

[Enrichment and quantitative determination of beer aroma substances by means of gas extraction.]

Anreicherung und quantitative Bestimmung von Bieraromastoffen mittels Gasextraktion.

Renner, R.; Bartels, H.; Tressel, R.

Monatsschrift fuer Brauerei 29 (11) 478-489 (1976) [41 ref. De, en, fr] [Forschungsinst. für Chem.-tech. Analyse, Versuchs- und Lehranstalt für Brauerei, Berlin (West)]

A method for isolation of aroma compounds from beer by gas extraction followed by selective adsorption on Porapak Q is described, based on the method of Jennings et al. [FSTA (1972) 4 5H728]. The aroma concentrate is analysed by GLC or GLC/MS; individual fractions may be tested organoleptically. Aroma compounds of bp 21-219°C may be determined, at concn. of 1-50 parts/billion. Results are comparable to those achieved by headspace GLC or liquid/liquid extraction. Approx. 50 constituents can be identified in beer aroma samples. This method was used in studies on volatiles in 4 types of Pils, and 1 type each of 'Märzen' beer, 'dark strong beer', wheat beer, 'Alt' beer, Berlin White beer, and 'double hopped' beer; a table of results is given. Effects of sunlight, pasteurization, UV irradiation and 2-yr storage on volatiles in Pils beers were also studied; volatile compound concn. differed little from those in normal beers. AJDW

103

[Application of differential UV spectrophotometry to lemon essential oil.]

Calapaj, R.; Ciraolo, L.

Essenze Derivati Agrumari 46 (3) 224-234 (1976) [15 ref. It] [Istituto di Merceologia dell'Univ., Messina, Italy]

Study of essential oil by differential (2 wavelengths) UV spectrophotometry showed spectral characteristics not detected by normal

(single wavelength) spectrophotometry. Interpretation of the curves obtained indicated that the max. values for ΔA at $\lambda = 334$ and 350 nm are due to furocoumarin and coumarin. The changes in spectra obtained by adulteration of essential oil through addition of these naturally occurring compounds are discussed with the aid of adsorption spectra. RM

104

Volatile constituents of cantaloupe, *Cucumis melo*, and their biogenesis.

Yabumoto, K.; Jennings, W. G.; Yamaguchi, M. *Journal of Food Science* 42 (1) 32-37 (1977) [25 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

The volatile emanations of cultivars of muskmelon were isolated by 3 procedures: direct sampling of melon cavity gases via a septum-sealed glass probe cemented to the melon, entrapment of large vol. of headspace gas on porous polymer traps, and steam distillation-extraction of pieces of melon fruit tissue. Essences were subjected to gas chromatographic analysis in high resolution wall-coated open-tubular glass capillary columns. Identifications were based on mass spectra, gas chromatographic retentions, and occasionally IR spectra. 47 compounds, dominantly esters, were identified and their concn. during ripening were followed. The biogenetic pathways for selected esters were studied by radioassay of volatiles produced by melon tissue incubated with selected radio-labelled precursors. [See also FSTA (1975) 7 4J630.] IFT

105

Odour characterization and threshold values of some volatile compounds in fresh mushrooms.

Pyysalo, H.; Suihko, M. *Lebensmittel-Wissenschaft und -Technologie* 9 (6) 371-373 (1976) [8 ref. En] [Food Res. Lab., Tech. Res. Cent. of Finland, Biologinkuja 1, SF-02150 Espoo 15, Finland]

The relative concn. of 10 volatile compounds in 7 spp. of mushroom are tabulated and the contribution of the compounds to mushroom flavour is discussed. A study was made of the threshold values (in water) and odour characteristics of the 10 compounds using 12-16 panellists. Threshold values were as follows (ppm): 1-octen-3-ol, 0.010; 1-octen-3-one, 0.004; trans-2-octen-1-ol, 0.040; trans-2-octenal, 0.003; 3-octanol, 0.018; 3-octanone, 0.050; octanol, 0.48; 1-octen-3-yl acetate, 0.09; 1-octen-3-yl propionate, 0.022; and nonanol 0.09. The most important aroma components in fresh mushrooms are concluded to be 1-octen-3-ol and 1-octen-3-one. JA

106

Studies on the volatile compounds of some berries in genus *Rubus*, especially cloudberry (*Rubus chamaemorus* L.) and hybrids between raspberry (*Rubus idaeus* L.) and Arctic bramble (*Rubus*

arcticus L.). [Review]

Pyysalo, T.

Publication, Technical Research Centre of Finland, Materials and Processing Technology No. 14, 25pp. (1976) [95 ref. En] [Food Res. Lab., Tech. Res. Cent. of Finland, Helsinki, Finland]

This review covers studies which attempted to identify, quantitatively determine and evaluate the volatile constituents of cloudberrries and raspberry/Arctic bramble hybrids. The paper contains the following sections: methods of identification of the volatile compounds; qualitative and quantitative composition of the volatile oil of cloudberry; inheritance of compounds characteristic to raspberry and Arctic bramble by hybrids between these berries; evaluation of the relative contribution of compounds identified in *Rubus* berries; and formation of the major volatiles in cloudberrries. JA

107

Organoleptic techniques in chromatographic food flavour analysis.

Parliment, T. H.; Scarpellino, R.

Journal of Agricultural and Food Chemistry 25 (1) 97-99 (1977) [6 ref. En] [General Foods Tech. Cent., White Plains, New York 10625, USA]

The ultimate goal of basic flavour research is to establish the identity and importance of the volatile components in a flavour essence. This paper presents a scheme which has been developed for establishing the organoleptic importance of the individual components of a flavour in a systematic fashion. The procedure involves collecting portions of the gas chromatographic effluent in an appropriate medium and then evaluating the individual fractions and combinations thereof, by modified flavour profile techniques. The analysis of blueberry essence is used to illustrate the utility of these procedures and it is shown that linalool and cis-3-hexenol are essential to a characteristic blueberry flavour. [See also FSTA (1976) 8 9A475.] AS

108

[Gas chromatographic studies of the aroma compounds of grapes. I. Concentration and separation on capillary columns.]

Gaschromatographische Untersuchungen über die Aromastoffe von Weinbeeren. I. Anreicherung und kapillarchromatographische Auftrennung.

Rapp, A.; Hastrich, H.; Engel, L.

Vitis 15 (1) 29-36 (1976) [19 ref. De, en]

[Bundesforschungsanstalt für Rebenzüchtung Geilweilerhof, 6741 Siebeldingen, Federal Republic of Germany]

1 kg fresh grapes were homogenized in a blender with 700 ml 65% methanol (purified with CCl_4), centrifuged, and the residue was re-extracted with 300 ml 65% purified methanol; the combined clear centrifugates were made up to a vol. of 1700 ml with 65% methanol, and extracted with 70 ml CCl_4 for 15 h at 27°C in an extraction apparatus

described and diagrammatically illustrated. The extract was concentrated to approx. 50 µl in a narrow flask, and 1 µl was analysed by GLC using a Carlo-Erba model 2101 AC apparatus with long capillary glass columns (approx. 70 m). ≤ 300 chromatogram peaks were obtained in this way; and it is pointed out that 65% methanol inactivates grape enzymes, so that the aroma compounds originally present are determined. An aromagram of Morio Muscat grapes is presented. The procedure is described in detail. SKK

109

Volatile components of papaya (*Carica papaya* L., Solo variety).

Flath, R. A.; Forrey, R. R.

Journal of Agricultural and Food Chemistry 25 (1) 103-109 (1977) [25 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

Volatile components of fresh papaya fruit were conc. by several different methods. The concentrates were examined by combined gas chromatography-MS, and a total of 106 compounds were identified. Linalool is the major component of these concentrates, followed by benzyl isothiocyanate. The relative proportions of the major components are shown to be dependent upon the treatment received by the fruit tissue before and during volatiles concn. AS

110

Biosynthesis of some volatile constituents of muskmelon, *Cucumis melo*.

Yabumoto, K.; Yamaguchi, M.; Jennings, W. G.

Chemie Mikrobiologie Technologie der Lebensmittel 5 (2) 53-56 (1976, publ. 1977) [19 ref. En, de, fr] [Dep. of Vegetable Crops, Univ. of California, Davis, California, USA]

Some precursor-product relationships for selected volatile compounds of cultivars of muskmelon were investigated via radiotracer techniques. Uniformly labelled ^{14}C -leucine and ^{14}C -isoleucine were injected separately into cantaloupe fruit tissues. After incubation, the principal volatile components were recovered by steam distillation-extraction followed by preparative gas chromatography. Isoleucine was converted into branched-chain esters that retained the branched-chain skeleton within the molecule at either the acid or alcohol moiety. On longer incubation, many of the volatile compounds, exhibited radioactivity, implying that the precursors had been metabolized. Some possible pathways are discussed. AS

111

[Volatile constituents of tomatoes: presence of trans-hexene-2-ol, and its enzymic formation.]

Sieso, V.; Nicolas, M.; Seck, S.; Crouzet, J. *Agricultural and Biological Chemistry* 40 (12) 2349-2353 (1976) [14 ref. Fr, en] [Lab. de Biochimie Applique, Univ. des Sci. et Tech. du Languedoc 34060, Montpellier Cedex, France]

112

Volatile components of unprocessed rice (*Oryza sativa* L.).

Bullard, R. W.; Holguin, G.

Journal of Agricultural and Food Chemistry 25 (1) 99-103 (1977) [11 ref. En] [Denver Wildlife Res. Cent., US Fish & Wildlife Service, Denver, Colorado 80225, USA]

Laboratory tests showed that the volatile flavour components of unprocessed rice are attractive to Philippine ricefield rats (*Rattus rattus mindanensis*). These results suggested that a synthetic bait attractant could be made if the important volatiles in rice were identified. To identify the compounds, ground rice was tumbled at 50°C in a modified rotary evaporator while helium swept the volatiles into a liquid N_2 trap coated with dibutyl phthalate. The dibutyl phthalate solution containing the volatiles was analysed by combination capillary column gas chromatography and MS. Altogether, 73 compounds were identified, including alcohols, aldehydes, alkyl aromatics, furans, ketones, terpenes, and naphthalenes. The structural types of another 31 compounds were indicated. Of the 73 compounds identified, only 9 have been previously reported in unprocessed rice and 54 have never been reported in any unprocessed cereal grain. AS

113

[Volatile substances in canned 'smoked fish in oil', manufactured by different methods.]

Rodina, T. G.; Lapshina, L. I.

Rybnoe Khozyaistvo No. 9, 64-67 (1976) [Ru] [MINKh im. V. G. Plekhanova, USSR]

The content and composition of 4 fractions of volatile substances (phenols, carbonyl compounds, acids and amines) in canned blanched fish in oil, aromatized with smoking liquid, are given. Of the 20 phenols found, carbonylic acid, guaiacol, and m-, p- and o-cresol predominated. The control (non-smoked) samples were free of phenols. 7-10 volatile fatty acids C1-C7 were found, the acetic and formic acids predominating. Of the volatile amines, most were triethylamine (84% of all amines) and butylamine. These were found mainly in the fish; the phenols and fatty acids were present mainly in the oil. The amounts of carbonyl compounds were roughly identical in smoked and non-smoked product. STI

114

[Studies on the odour of walleye pollack. I. Identification of odour constituents in carbonyl, acidic and basic fractions of kamaboko.]

Nakamura, M.; Tamoto, K.; Kasahara, K.; Nishibori, K.

Scientific Reports of the Hokkaido Fisheries Experiment Station [Hokkaidoritsu Suisan Shikenjo Hokoku] No. 17, 19-27 (1975) [1 ref. Ja, en]

Processed fish products prepared from walleye pollack may have an odour disliked by consumers. Volatiles were determined by GLC in samples of 'kamaboko' (packaged in a casing) made from walleye pollack. Tables and chromatograms of

results are given. Constituents identified included acetaldehyde, propionaldehyde, n-butyraldehyde, isovaleraldehyde, methyl ethyl ketone, n-capronaldehyde, acetic acid, isobutyric acid, n-butyric acid, isovaleric acid, n-valeric acid, n-caproic acid, trimethylamine, dimethylamine, methylamine and NH_3 ; sorbic acid (added as a preservative) was also identified. 2 unidentified compounds in the high-bp acidic fraction were associated with the unpleasant odour. The water-bleaching process used in kamaboko manufacture influenced the quantitative composition (but not the qualitative composition) of the volatile fractions. [From En summ.] AJDW

115

[The composition of sausages in Lower Saxony. III. Composition of liver sausage.] Die Zusammensetzung von Wurstwaren in Niedersachsen. III. Die Zusammensetzung von Leberwürsten. Martienssen, E. *Fleischwirtschaft* 57 (1) 113-115 (1977) [De, en, fr] [Staatliches Chem. Untersuchungsamt, Philosophenweg 36, 2900 Oldenburg, Federal Republic of Germany]

1751 analyses carried out between 1970 and 1975 were used as a basis for determining guide values for 3 quality grades of liver sausages in Lower Saxony. Full results are tabulated and the following standards proposed for top and medium quality sausages (means and 80% values): meat protein top quality 13.0 and 11.5%, and medium quality 12.0 and 10.5%; connective-tissue-protein-free meat protein (BEFFE) 11.0 and 9.5%, and 9.5 and 8.0%; BEFFE in meat protein 86 and 82%, and 80 and 74%; fat (absolute) 37 and 42%, and 40 and 48%; fat:meat protein ratio 3.5 and 4.0, and 3.6 and 4.0. No data are quoted for 'ordinary' quality, as there is very little of it on the market. [See FSTA (1976) 8 6S906 for previous part.] RM

116

Flavor components of cured pork products.

[Lecture]

Heidemann, F. H.; Wismer-Pedersen, J. *Proceedings of the European Meeting of Meat Research Workers* No. 22, A6:1-A6:6 (1976) [7 ref. En, fr, de, ru] [Dep. of Meat Tech., Royal Vet. & Agric. Univ., Howitzvej 11, DK-2000 Copenhagen F, Denmark]

61 volatile components were separated and characterized from nitrite-cured pork after heat treatment. Of these 14 were aldehydes, 6 ketones, 11 S compounds and 5 furans. 20 of these compounds have not previously been identified from pork products. The concn. of the characterized compounds were compared with their threshold concn. of perception, and 10 S compounds, 8 aldehydes, 2 ketones and 2 furans considered of importance as flavour compounds. The components, isolated from headspace above heated meat or by concn. of vacuum distillates,

were separated by GLC, and characterized partly by refraction time, partly by MS. All the identified components were isolated from fresh as well as cured meat but in different concn. With regard to S compounds, the most volatile, like H_2S and methyl mercaptan, were most abundant in vapours from fresh meat, while the less volatile disulphides were at their highest concn. in vapours from cured meat. Short chain carbonyls (C2-C5) were at their highest concn. over cured meat and medium chain (above C5) carbonyls over fresh meat. [See FSTA (1977) 9 6S988.] AS

117

A comparison of the chemical composition of boiled and roasted aromas of heated beef.

MacLeod, G.; Coppock, B. M.

Journal of Agricultural and Food Chemistry 25 (1) 113-117 (1977) [41 ref. En] [Dep. of Food Sci. & Nutr., Queen Elizabeth Coll., London W8 7AH, UK]

Using a modified Likens and Nickerson extraction procedure [FSTA (1976) 8 12S2097] followed by low temp./high vacuum distillation, representative samples of aroma volatiles were obtained from beef while cooking by microwave radiation and by conventional means. Separation of the components of the isolates was achieved by gas chromatography and the majority of the components were identified by combined gas chromatography/MS. A comparative study was undertaken of the effect of cooking variations on the volatile components liberated. Such variations included heating in the presence and in the absence of water and for different periods of time for both conventional and microwave heating methods. Results indicated that certain carbonyl compounds, sulphides, pyrroles, and pyridines are probably important contributors to roasted notes as opposed to boiled or brothy qualities of heated beef aroma. AS

118

[Flavor concentrates.]

Kikkoman Syoyu Co. Ltd.

Japanese Patent 5 137 335 (1976) [Ja]

Flavour components are collected from alcoholic beverages or foods by distillation of water vapour followed by mixing with ethyl alcohol and redistillation. IFT

119

Methods of test for essential oils.

United Kingdom. British Standards Institution *British Standard* BS 2073, 26pp. ISBN 0-580-09215-1 (1976) [En] Price £4.70 [2 Park Street, London W1A 2BS, UK]

Methods of test for essential oils by physical, chemical and gas chromatographic procedures are specified. AL

120

Lactones in foods. [Review]

Maga, J. A.

CRC Critical Reviews in Food Science and Nutrition 8 (1) 1-56 (1976) [159 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado, USA]

Lactones represent an important class of flavour compounds that have been found in a wide variety of foods, although traditionally they have been mainly associated with dairy products. This review summarizes their occurrence in foods, together with their formation pathways, sensory properties, and isolation, identification and synthesis techniques specific to lactones associated with food flavour.

AS

121

Simultaneous detection of nitrogen and sulfur containing flavor volatiles.

Withycombe, D. A.; Walrad, J. P.

Abstracts of Papers, American Chemical Society 170, AGFD 13 (1975) [En] [Int. Flavors & Fragrances, 1515 Highway 36, Union Beach, New Jersey 07735, USA]

The well-established use of S and N selective detectors for gas chromatography is briefly reviewed with emphasis on their application to flavour-related analyses. A gas chromatographic system is described which allows simultaneous recording of S, N and flame ionization detector signals plus odour assessment or collection of eluted components. Several applications of the instrument to flavour analysis, including its use with glass capillary columns, are shown and discussed. AS

122

Objective specification of food flavour. Analysis of gas chromatographic profiles of soy sauce flavour by stepwise regression analysis.

Aishima, T.; Nobuhara, A.

Food Chemistry 2 (2) 81-93 (1977) [8 ref. En] [Cent. Res. Lab. of Kikkoman Shoyo Co. Ltd., Noda-shi, Chiba-ken, Japan]

The relationship between GLC profiles and sensory tests (carried out by the order of preference method) was investigated by stepwise regression analysis. Results indicated that sensory qualities were linearly related to GLC profiles. The multiple correlation coeff. (R) increased with the increase of the step number exceeding 0.9 at step 10 and reaching 0.968 at the last step, number 43. The standard error of the estimate reached a min. at step 28 and then gradually increased. The most predictive regression model for sensory test panel acceptability was calculated for each step and the resulting calculated models were tested by substituting the GLC data. The results showed good accuracy for the estimation of sensory quality.

AS

123

Nonenzymic reductive amination of conjugated carbonyls: a novel source of nitrogenous flavor compounds in browned foodstuffs.

Rizzi, G. P.

Abstracts of Papers, American Chemical Society 170, AGFD 16 (1975) [En] [Procter & Gamble Co., Winton Hill Tech. Cent., 6071 Center Hill Road, Cincinnati, Ohio 45224, USA]

A close analogy exists between the mechanisms of the Strecker degradation and the non-enzyme mediated reactions of vitamin B₆ aldehyde in that a high electron density in the carbonyl moiety is prerequisite for subsequent reductive amination. Through this analogy it was possible to effect Strecker type reductive aminations of alk-2-enals, alka-2,4-dienals and aromatic aldehydes to yield corresponding unsaturated primary amines. While the normal Strecker products from 1,2-dicarbonyls, i.e. amino reductones, are labile toward polymerization and/or cyclization to pyrazines, the products of conjugated carbonyl/amino acid reactions are stable but they too constitute potential aroma-taste components in food systems. The extended Strecker pathway provides a means for transferring N into food aldehydes produced by fat autoxidation, natural terpenes and flavonoids.

AS

124

Reaction products of α -dicarbonyl compounds, aldehydes, hydrogensulfide and ammonia.

Takken, H. J.; Linde, L. M. van der; Valois, P. J. de; Dort, J. M. van; Boelens, H.

Abstracts of Papers, American Chemical Society 170, AGFD 15 (1975) [En] [Naarden Int. Res. Dep., PO Box 2, Naarden-Bussum, Netherlands]

Investigations of the reaction products of aldehydes, H₂S and NH₃ [FSTA (1975) 7 6T281] were continued by analysing the reaction products of aldehydes, H₂S, NH₃ and α -dicarbonyl compounds. The α -dicarbonyls and aldehydes used were: 2,3-butanedione, 2-oxopropanal, 2,3-pentanedione, ethanal, propanal and 2-butenal. The most important reaction products identified were: α -mercaptoketones, 1,2,4-trithiolanes, 1,3-dithioles, oxazoles, thiazoles, thiazolines, dihydro-1,3,5-dithiazines and imidazoles. Several of the reaction products have been identified as flavour constituents in meat and roasted food flavours.

AS

125

Comparison of extracting solvents for typical volatile components of Eastern grape juices and wines in a model aqueous-alcoholic system.

Cobb, C. S.; Bursey, M. M.

Abstracts of Papers, American Chemical Society 170, AGFD 61 (1975) [En] [Venable and Kenan Chem. Lab., Univ. of N. Carolina, Chapel Hill, N. Carolina 27514, USA]

The most common procedure for studying volatile components of grape juices and wine

involves obtaining a conc. essence by extraction with an organic solvent and rotary evaporation of the solvent. A study was undertaken to determine the relative extraction and recovery efficiencies of 4 commonly used solvents. A model system containing a total of 300 ppm (v/v) Concord (*Vitis labrusca*) flavour compounds in a 12% (v/v) ethanol-water mixture was extracted with each solvent. The diethyl ether, dichloromethane, 2-methylbutane, and Freon 11 (trichlorofluoromethane) extracts were conc. by rotary evaporation and analysed by GLC with flame ionization detection. Freon 11 demonstrated the largest overall extraction and recovery efficiency for the flavour compounds, with the exception of the most volatile components including C_4 alcohol. In these cases, dichloromethane gave the best results. Comparison of the extracted essences with a standard mixture of the unextracted flavour compounds illustrated the loss of components during this typical isolation procedure. AS

126

[Study of volatile fatty acids in molasses using capillary gas chromatography.]

Hrivnak, J.; Medved, M.

Kvasny Prumysl 22 (10) 232-233 (1976) [4 ref. Sk, ru, en, de] [Chemicky Ustav VK, Bratislava, Czechoslovakia]

A method for detn. of volatile fatty acids in molasses is described. The acids are distilled into a receiver containing alkali, after which they are conc., acidified and extracted with ethyl ether. The extract is conc. and analysed by chromatography using a capillary column of 45 m length and 0.2 mm diam. Polypropylene glycol is used as the liquid phase. The apparatus used was the Fractovap model G1 from the firm Carlo Erba, Milan, Italy. The operating temp. of the column was 140°C, temp. in the metering area was 190°C and pressure of N_2 at the beginning of the column was 1 kg/cm². The following acids were found in molasses: propionic, iso-butyric, n-butyric, 3-methylbutyric, (\pm)2-methylbutyric, n-valeric and caproic acid. STI

127

[Detection and determination of four compounds limited in alcoholic beverages by various legislations.]

Liddle, P. A. P.; Smedt, P. de

Annales des Falsifications et de l'Expertise Chimique 69 (747) 857-864 (1976) [16 ref. Fr, en, de] [Lab. de Recherches de la Soc. Martini & Rossi, 19 Avenue Michelet, 93404 Saint-Quen, France]

As MS-GLC method is described for the detection and detn. of small amounts of thujone, safrol, β -asarone and coumarin in alcoholic beverages. These compounds are among those whose presence is limited or prohibited in foods and beverages by legislation in various countries. The method was applied to vermouth, and some

problems of interference by other compounds are discussed. Analysis of 12 samples of red, white and dry vermouths revealed no β -asarone, 0.01-0.3 mg/l. α -thujone, 0-0.08 mg/l. β -thujone and 0-0.1 mg/l. safrol; only 2 samples contained coumarin (0.2 and 3.5 mg/l.). RM

128

[Volatile constituents of roasted coffee.]

Vitzthum, O. G.; Werkhoff, P.

Annales des Falsifications et de l'Expertise Chimique 69 (746) 725-735 (1976) [18 ref. Fr] [Dep. of Sci. de la Soc. Hag, Hagstrasse, D 28 Bremen, Federal Republic of Germany]

A large number of previously unidentified volatile components was determined in trace amounts down to 1 part/billion from roasted coffee volatiles by steam distillation or extraction with supercritical CO_2 under pressure, followed by MS-GLC. By these methods, the limit of detection was lowered by a factor of 10^2 permitting the first recorded detection of indoles, quinoleins, cycloalkylpyrazines (mainly acetyl and furyl), several oxazoles and thiazoles, furans, pyrroles (including N-acetyl and N-propionyl pyrrole), and thiophenes as well as methyl furfuryl disulphide. The structure of many compounds was confirmed by synthesis. The good agreement between the chromatograms obtained from both types of extract confirmed that no artefacts were formed during steam distillation. RM

129

[Science of soybean milk.] [Review]

Fukushima, D.

Up-to-Date Food Processing [Shokuhin Kaihatsu] 10 (2) 20-26 (1975) [34 ref. Ja] [Noda Inst. Ind. Res., Choshi, Chiba, Japan]

The nutritive value of soybean milk (SBM) is improved by heating for 60 min at 93°C or for 5-10 min at 121°C. This is partly because of inactivation of undesirable proteins such as trypsin inhibitor and haemagglutinin, but also because of denaturation of major proteins. SBM is nutritionally superior to cows' or human milk in containing far more linoleic acid. Flavour components of soybean, defatted soybean, and protein isolate are tabulated. Major components responsible for the flavour of SBM are 1-octen-3-ol, produced during steeping of soybeans in water, and ethyl vinyl ketone, produced by lipoxygenase. New methods of preparing SBM are discussed, e.g. steeping in water, or crushing with hot water at 80°C, and filtering, extruder cooking, treatment in a colloid mill with additions of water, soybean oil, and an emulsifier, high-pressure homogenization, spray-drying, and mixing with sugar, NaCl, flavour essence, and vitamins, including vitamin E. SKa

130

[Changes of some volatile compounds during maturing of distilled beverages.]

Khiabakhov, T. S.; Nechaev, L. N.

Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii 31 (10) 32-34 (1976) [Ru] [Vses. Nauchno-issled. Inst. Vinogradarstva i Vinodeliya, Novochoerkassk, USSR]

Distilled beverages were studied during several yr storage in oakwood casks. Volatile compounds were determined by gas chromatography after direct injection into the chromatograph, using a 50 m capillary column. Results are presented (in a table and graph) for 20 compounds. In addition to chemical analysis a sensory evaluation was made. Comparisons are made between results at the start of the experiment and after 1, 2 and 3 yr storage. STI

131

Sulfur and nitrogen compounds in vegetable flavor. Buttery, R. G.

Abstracts of Papers, American Chemical Society 170, AGFD 21 (1975) [En] [W. Regional Res. Lab., USDA, 800 Buchanan Street, Albany, California 94710, USA]

The characterization of a number of unusual S and N compounds in some vegetables and the odour properties of these and of some related synthetic compounds are discussed. AS

132

Commercial orange essence: comparison of composition and methods of analysis.

Lund, E. D.; Bryan, W. L.

Journal of Food Science 42 (2) 385-388 (1977) [12 ref. En] [USDA Citrus & Subtropical Products Lab., S. Region, Winter Haven, Florida 33880, USA]

Quality of 3 commercial orange essences was related to composition determined by gas chromatography. 2 essences were unacceptable in flavour; the third was typical with a high flavour score. The technique of directly analysing untreated essence was adequate for most components. Of the 21 identified, 3 were present in reduced concn. in unacceptable essence and 6 were present in high concn. The 3 components found in low concn. (acetaldehyde, ethyl butyrate, ectanal) are known contributors to desirable flavour while 2 of the components found in high concn. (trans-2-hexenal, α -terpineol) are known contributors to off-flavour. Determination of flavour and off-flavour components by gas chromatography of directly injected essence appears promising as a rapid, objective technique for quality control. IFT

133

[Gas chromatographic investigation of flavour substances in some apple varieties grown in Hungary.]

Vamos-Vigyazo, L.; Pozsar-Hajnal, K.; Kiss-Kutz, N.

Elelmiszervizsgalati Koezlemlenyek 22 (4) 188-199 (1976) [12 ref. Hu, ru, de, en] [Központi Elelmiszertipari Kutató Int., Budapest, Hungary]

Flavour components present in the flesh and skin, and in the gas evolved from the skin in a closed space, of the apple var. Jonathan, Jonared, Jonadel, Golden Delicious and Staymared grown in Hungary were investigated by gas chromatography (chromatograms presented). 34 components were isolated from the steam distillates and from the head space. About one third of these components were identified on the basis of retention times, using suitable model substances. The flavour composition of the individual var. and within the same var., and also the flavour composition of the flesh and of the skin revealed both qualitative and quantitative differences. The deviations were however smaller between the flavour profiles of var. closely related to each other. IF

134

Flavor components of unprocessed rice (*Oryza sativa* L.).

Bullard, R. W.; Holguin, G.

Abstracts of Papers, American Chemical Society 170, AGFD 48 (1975) [En] [Denver Wildlife Res. Cent., US Fish & Wildlife Service, Denver, Colorado 80225, USA]

Ground rice was tumbled at 50°C in a modified rotary evaporator while helium swept the volatiles into a dibutyl phthalate-coated liquid N₂ trap. The dibutyl phthalate solution containing the volatiles was analysed by combination capillary-column gas chromatography and MS. 73 compounds were identified, including alcohols, aldehydes, alkyl aromatics, furans, ketones, terpenes, and naphthalenes, and the identity of 31 more was predicted. Of the 73 compounds identified, only 9 had been previously reported in rice, and 54 had never before been reported in any unprocessed cereal grain. AS

135

[Changes in volatile constituents and the microflora of corn stored under different conditions of temperature and humidity.]

Richard-Molard, D.; Cahagnier, B.; Poisson, J.; Drapron, R.

Annales de Technologie Agricole 25 (1) 29-44 (1977) [17 ref. Fr, en, es, it] [Sta. de Biochimie & Physicochimie des Cereales, INRA, 15 Rue Nicolas Fortin, 75013 Paris, France]

Samples of INRA 260 corn (initial moisture contents 15, 20 or 33%) were stored at 5° or 22°C and 75, 87 or 98% RH for \leq 50 days. At intervals, the moisture content, counts of moulds, bacteria and

yeasts, and concn. of various volatile compounds were determined. Tables and graphs of results are given, together with GLC chromatograms. In general, microbial growth and formation of volatiles increased with increasing moisture content and storage temp. Volatiles formed varied with the storage conditions; however, formation of octen-1-ol-3 was generally associated with growth of typical 'storage' species of moulds. It is suggested that detn. of specific volatiles might provide a sensitive method of detection of early stages of fungal spoilage of corn. AJDW

136

Volatile components from triolein heated in air.
Selke, E.; Rohwedder, W. K.; Dutton, H. J.
Journal of the American Oil Chemists' Society 54 (2) 62-67 (1977) [23 ref. En] [N. Regional Res. Cent., USDA, Peoria, Illinois 61604, USA]

In a continuing study to identify volatile odour constituents and their precursors from heated soybean oil, the following model triglycerides were heated to 192°C in air for 10 min: pure triolein, a mixture of triolein (25%)-tristearin, and a randomly esterified triglyceride composed of oleic (25%) and stearic acids. Each model system produced the same major compounds which were identified as heptane, octane, heptanal, octanal, nonanal, 2-decenal, and 2-undecenal. These 7 compounds apparently are unique to the oxidation of the oleate fatty acid in each triglyceride sample. Minor volatile compounds from oxidized triolein included saturated and unsaturated aldehydes and n-hydrocarbons and saturated primary alcohols, methyl ketones, gamma lactones, and monobasic acids. Incorporation of stearic acid in the triglycerides noticeably increased the amounts of saturated minor compounds and the range of their carbon chain lengths. Decomposition products characteristic of the oxidation of stearate were apparent among decomposition products associated with the oxidation of oleate. AS

137

[Losses of volatile compounds during fluidized bed freeze-drying of comminuted frozen yoghurt.]
Karadimov, D. S.; Karadimova, Z. A.
Nauchni Trudove, Vissh Institut po Khranitelna i Vkusova Promyshlennost 23 (1) 305-313 (1976) [8 ref. Bg, ru, en] [Katedra po Protsepi i Aparati, VlpKHiVP, Plovdiv, Bulgaria]

Losses of volatile compounds during fluidized bed freeze-drying of yoghurt at final temp. of 30°, 35° or 40°C were measured by GLC. Values for 14 unidentified and 8 identified compounds are tabulated. Total quantities in terms of wt. of initial yoghurt were 0.01, 0.012 and 0.016% respectively. 3 compounds (2-butanone, 4-methyl-2-pentanone and 3-pentanone) were present in relatively larger quantities, but as none of them contribute to yoghurt aroma, the aroma of the dried product was unchanged, which was also confirmed by organoleptic tests. SKK

138

[Camembert aroma: identification of minor constituents.]

Dumont, J. P.; Roger, S.; Adda, J.
Lait 56 (559/560) 595-599 (1976) [13 ref. Fr, en] [Lab. de Tech. Laitiere, INRA, Jouy-en-Josas, France]

The volatile components of Camembert cheese were isolated by low temp. vacuum distillation. The distillate, saturated with NaCl, was adjusted to pH 9 and extracted first with Freon II and then with dichloromethane. The Freon extract was fractionated on a column of silicic acid and the fractions analysed by combined GLC-MS. The dichloromethane extract was analysed directly by GLC-MS. In addition to previously identified compounds [FSTA (1975) 7 8P1913] the following, new minor components with cheese aroma were detected: bis(methylthio)methane; diethyldisulphide; 2,4,5-trithiahexane; 1,1'-bis(methylthio)dimethylsulphide; 3-methylthiopropanol and 3-methyl-2-cyclohexen-1-ol. MEG

139

Flavor precursors in food systems.

Schutte, L.

Abstracts of Papers, American Chemical Society 170, AGFD 14 (1975) [En] [UniMills BV, Lindtsedijk 8, Zwijndrecht, Netherlands]

3 types of meat flavour may be distinguished: taste mixtures composed of non-volatiles like monosodium glutamate, ribonucleotides and organic acids; mixtures of volatile compounds ('top-notes') like furanones, thiophenes and aldehydes, which give a specific meaty odour; and so-called 'reaction flavours'. The latter comprise precursors which react upon heating to yield mixtures with a basic meat flavour balancing the rather harsh top-notes. The precursors of meat flavour generally consist of S compounds like cysteine, thiamine or H₂S releasers and carbonyl compounds like monosaccharides, aldehydes or furanones. Each of the 3 flavour types makes its specific contribution to the formation of meat flavour. A well-balanced combination of the 3 leads to a total meat flavour, although the presence of some natural meat flavour is still required for best results. AS

140

Non-volatile nitrogen and sulfur compounds in red meats and their relation to flavor and taste.

Mabrouk, A. F.

Abstracts of Papers, American Chemical Society 170, AGFD 23 (1975) [En] [Food Sci. Lab., US Army Natick Development Cent., Natick, Massachusetts 01760, USA]

Age of the animal, type of feed, animal condition, type of meat cuts, etc. strongly affected the taste and flavour of meats. Non-volatile N and S compounds play an important role in the development of the characteristic flavours of red

meats. Their pharmacological effect, relative importance, and their role in the formation of flavour components are discussed. Speculations on the reasons for differences in red meat flavours are presented. AS

141

The alkylbenzenes in roast beef.

Min, D. B.; Ina, K.; Peterson, R.; Chang, S. S. *Abstracts of Papers, American Chemical Society* 170, AGFD 46 (1975) [En] [Dep. of Food Sci., Rutgers Univ., New Brunswick, New Jersey 08903, USA]

Volatile flavour compounds of 150 lb roast eye round beef were isolated by flash vaporization followed by evaporation from a continuous heated thin film under vacuum. The isolated flavour which had a typical roast beef flavour was separated into acidic, basic, and neutral fractions. The neutral fraction which had a beef aroma was fractionated by repeated GLC and individual fractions were analysed by coupled gas chromatography-MS. 16 alkylbenzenes: 11 homologous n-alkylbenzenes (benzene to n-decylbenzene), styrene, xylene, trimethylbenzene, methylethylbenzene, and tetramethylbenzene, were identified in the neutral fraction. n-pentyl, n-hexyl, n-heptyl, n-octyl, n-nonyl, and n-decylbenzenes, styrene, xylene, and tetramethylbenzene had not been reported previously as volatile components in roast beef. The possible mechanism of formation of n-alkylbenzenes is discussed. Although none of these compounds can be considered to have a typical roast beef flavour, they are believed to contribute to the overall roast flavour quality. AS

142

Identification and flavor properties of some 3-oxazolines and 3-thiazolines isolated from cooked beef.

Mussinán, C. J.; Wilson, R. A.; Katz, I.; Sanderson, A.; Vock, M. H. *Abstracts of Papers, American Chemical Society* 170, AGFD 22 (1975) [En] [Int. Flavors & Fragrances Inc., 1515 Highway 36, Union Beach, New Jersey 07735, USA]

Four 3-oxazolines and two 3-thiazolines were isolated from beef cooked in a sealed stainless steel vessel at 162.7° and 182°C. The compounds were identified by matching retention times and mass spectra with those of authentic compounds synthesized in the laboratory. The compounds identified were: 2,4-dimethyl-3-oxazoline; 2,4,5-trimethyl-3-oxazoline; 2,4-dimethyl-5-ethyl-3-oxazoline; 2,5-dimethyl-4-ethyl-3-oxazoline; 2,4-dimethyl-3-thiazoline; and 2,4,5-trimethyl-3-thiazoline. The synthesis, spectra and flavour properties of these and some related compounds are discussed. AS

143

Effect of heating time on volatile composition of canned pork meat.

Uchman, W.; Jennings, W. G. *Food Chemistry* 2 (2) 135-144 (1977) [12 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

Volatiles from samples of ground pork meat, subject to 10, 20, 30 and 40 min heating at 121°C, were isolated by trapping on Tenax GC and Porapak Q. Essences were compared on wall-coated open-tubular glass capillary columns and analysed by glass capillary GLC-MS. Low mol. wt. alcohols, many with branched-chain skeletons, mercaptans and cyclic products were among the compounds identified. The amount of volatiles present appeared to correlate well with the heating time to which the sample had been subjected. AS

144

Identification of some volatile compounds in cooked chicken.

Horvat, R. J. *Abstracts of Papers, American Chemical Society* 170, AGFD 47 (1975) [En] [Richard B. Russell Agric. Res. Cent., PO Box 5677, Athens, Georgia 30604, USA]

A fraction isolated from boiling chicken broth using a Likens-Nickerson continuous steam distillation and pentane extraction apparatus was analysed by gas chromatography-MS using both packed and 500 ft × 0.03 in open tubular columns. In addition, some of the compounds identified were separated by GLC and trapped; their identity was confirmed by MS and IR analyses. 47 compounds were identified; 22 had not been previously identified in cooked chicken. Compounds identified include H₂S, mercaptans, sulphides, propyl disulphide, 3,5-dimethyl-1,2,4-trithiolane, 2-alkyl furans, aldehydes, ketons, cyclic and acyclic, fatty acids, alcohols, hydrocarbons, alkyl benzenes, 2-methyl pyrazine, and n-undecyl cyanide. The identification of these additional compounds enforces the conclusion that cooked chicken volatiles are an exceedingly complex mixture. AS

145

Influence of bacterial growth on porcine muscle ultrastructure and headspace volatiles.

Abbott, M. T. *Dissertation Abstracts International*, B 37 (6) 2744: Order No. 76-27055 (1976) [En] [Michigan State Univ., East Lansing, Michigan 48824, USA]

Sliced (approx. 3 mm) red and white portions of aseptic porcine semitendinosus muscle were dip-inoculated with *Pseudomonas fragi*, *Bacillus pumilus*, *Staphylococcus aureus* or *Clostridium perfringens* and incubated (at 10°, 10°, 15° and 30°C, respectively, for the 4 organisms) for ≤ 168 h; samples were examined by electron microscopy and

for pH and total bacterial counts. Ground aseptic porcine longissimus dorsi muscle was inoculated with *Ps. fragi* or a mixed culture (obtained from hamburger) and incubated for ≤ 96 h; samples were analysed by sensory and GLC headspace techniques. Uninoculated muscle served as controls in both studies. Bacterial growth and ultrastructural degradation were not influenced by fibre type. Changes in tissue pH were related to bacterial growth but not to fibre type. Growth of *B. pumilus* produced no detectable ultrastructural change but the other 3 organisms produced extensive degradation. Degradation appeared to starch with I-band breakage, after which the I-band/Z-line material became diffuse and finally indistinguishable. The A-band region of the myofibril was most resistant to microbial attack. Results of GLC analysis of headspace volatiles indicated that this technique may be useful in detecting the onset of meat spoilage. JA

146

[Determination of the origin of aroma compounds by isotope mass spectrography.]

Bricout, J.; Koziol, J.

Annales des Falsifications et de l'Expertise

Chimique 69 (747) 845-855 (1976) [13 ref. Fr]

[Inst. de Recherches Appliquées aux Boissons, 120 Avenue Foch, 94003 Creteil, France]

The use of the stable isotope ratios for identifying the origin of flavour compounds is discussed. After describing the techniques and sample preparation for MS, the variation in $^{13}\text{C}/^{12}\text{C}$ ratios is explained in terms of the photosynthetic pathway (Calvin or Hatch-Slack cycle). Tabulated results show the differences in $^{13}\text{C}/^{12}\text{C}$ ratios of vanillin extracted from *Vanilla planifolia* (acid photosynthetic mechanism, with both cycles coexisting) and synthesized from lignin (Calvin cycle), and the variations in the D/H ratio of various aroma compounds in a number of herbs, and in synthetic products. The following D/H ratios were observed: natural linalool 120.1, synthetic 129.4; natural l-carvone 112.7, synthetic 127.5; natural l-menthol 94.4, synthetic 116.4; natural vanillin 147.3, synthetic 125.7; and natural ethanol (beet sugar) 113.7, synthetic 135.2. RM

147

[Chemical types of aromatic plants. The polyploid calamus (sweet flag).]

Cavazza, G.

Annales des Falsifications et de l'Expertise

Chimique 69 (747) 833-844 (1976) [10 ref. Fr]

[Soc. Martini et Rossi, 19 Avenue Michelet, 93404 Saint-Ouen, France]

The appearance, essential oil contents and composition, and the physico-chemical composition and organoleptic character of aqueous alcohol extracts of commercial preparations of dried sweet flag are discussed on the basis of own and published results. Higher essential oil contents were found in

the tetraploid Indian var. Jammu (4.2% own, 5-6.82% published results) than in the triploid European var., and much higher β -asarone concn. (77.12-82%, vs. 2.5-9.5% in European var., published results). The β -asarone concn. was much lower in the alcoholic aqueous-extracts used for flavouring beverages, and varied even between European samples. Detn. of β -asarone in each sample is recommended before use. An accuracy of 0.1 ppm is achieved by GLC with a FFAP column and internal standard of anethol. RM

148

[Analysis of vanilla extracts and food products flavoured with these extracts.]

Meili, M.; Chaveron, H.

Annales des Falsifications et de l'Expertise

Chimique 69 (746) 745-756 (1976) [5 ref. Fr]

[Dep. de Genie Biol., Univ. de Tech. de Compiègne, France]

The following methods are described for analysis of vanilla flavour components: extraction from liquid vanilla, solid (powdered) vanilla, fat-containing food products; analysis of flavour compounds - TLC of aldehydes, acids and alcohols, anisic acid, and coumarin; GLC on carbowax 20M, GLC of trimethylsilyl derivatives on SE30. Results allow characterization of the products as well as detection and detn. of flavour compounds not present in natural vanilla. The ratio parahydroxy benzaldehyde:vanillin is determined by GLC on either stationary phase. RM

149

Stable aroma, flavor, and aroma and flavor products from aroma and flavor-bearing substrates.

Strobel, R. G. K. Procter & Gamble Co.

United States Patent 3 997 685 (1976) [En]

Wet steam is slowly and continuously passed into a zone containing an aroma and flavour-bearing substrates of roast, ground coffee, tea, fruit or vegetables at reduced pressure in a manner to provide a continually moving interface between the dry and wetted particles. The resulting gaseous concentrate is cooled to -20 to -200°C to yield a frost fraction containing aroma and flavour elements. The fractions are combined with a solid protein or carbohydrate material and freeze-dried. IFT

150

[Identification and control of aromatic food plants.]

Paris, M.; Clair, G.; Paris, R.

Annales des Falsifications et de l'Expertise

Chimique 69 (747) 813-820 (1976) [16 ref. Fr]

[Lab. de Matière Méd., Fac. de Pharmacie, Paris V, France]

This review includes a definition of herbs and spices, botanical and physico-chemical control methods, i.e. microscopic, organoleptic and macroscopic examination, identification of

constituents (TLC, GLC), and quantitative analysis. It is illustrated with gas chromatograms of thyme and mint essence, and a table of plants subject to standards (French and European Pharmacopeia, AFNOR, and ISO). RM

151

Gas phase concentration of volatiles in equilibrium with a liquid aqueous phase.

Voilley, A.; Simatos, D.; Loncin, M.

Lebensmittel-Wissenschaft und -Technologie 10 (1) 45-49 (1977) [12 ref. En] [ENSBANA, CUM, 21 000 Dijon, France]

The aims of the study were to examine the influence of a non-volatile solute on the phase equilibrium concn. of volatile compounds in dilute aqueous model solutions and to investigate the factors which influence the odour of such solutions. The volatile studied were acetone and 1-octanol (at concn. of 100 ppm), in the presence of sugars (glucose, fructose and sucrose), high-methoxy pectins, CaCl_2 or citric acid. The aqueous solutions produced were subjected to headspace and sorption analysis. The results, which are discussed and explained, have practical applications, e.g. in a food product different concn. of a particular volatile can be obtained in the gas phase as a function of the composition of the solids dissolved in the aqueous phase and this could be used to alter the intensity of the food's aroma. JA

152

Concentration of headspace, airborne and aqueous volatiles on Chromosorb 105 for examination by gas chromatography and gas chromatography-mass spectrometry.

Murray, K. E.

Journal of Chromatography 135 (1) 49-60 (1977) [31 ref. En] [CSIRO Div. of Food Res., PO Box 52, North Ryde, NSW 2113, Australia]

Techniques are described for the collection of volatile material from headspace vapours and atmospheric pollutants and for the direct extraction of volatiles from aqueous solution by traps containing the porous polymer Chromosorb 105. The traps are inserted through a valve into a gas chromatograph which facilitates the desorption and transfer of the volatiles to high-resolution capillary columns. Applications include examination of volatiles of passion fruit juice, isolation and identification of trace vegetable constituents, examination of wine and brandy volatiles, investigations of taints in foodstuffs, refrigerators and cold store rooms, analysis of volatiles from steam distillates of canned vegetables with a 'disinfectant' taint, a study of volatiles associated with the cooking of vegetables and recovery of volatiles from brandy. AL

153

Gas chromatographic-mass spectrometric investigation of metabolites of some microorganisms producing volatile aroma

compounds. (In '5th International Fermentation Symposium' [see FSTA (1977) 9 8G557].) [Lecture]

Apetz, M.; Tressl, R.; Windisch, S.

p. 502 (1976) [1 ref. En] [Lehrstuhl für Chem.-Tech. Analyse, Tech. Univ., Berlin (West)]

The volatiles produced by 3 microorganisms were extracted by liquid-liquid extraction using hydrophobic polar solvent mixtures (pentane/ether or pentane/methylene chloride). The extracts were dried, conc. and methylated with diazomethane. The concentrates were separated by column chromatography on adsorbents (e.g. aluminium oxide, silica gel), using solvents of increasing polarity, and the eluates were separated by gas chromatography on packed columns coated with Carbowax 20M, FFAP and OV-17. Trace volatiles were concn. by preparative gas chromatography. The volatiles were identified by combined gas chromatography-MS; IR spectroscopy could also be used. Of the 3 organisms, *Endomyces magnusii* produced volatiles with a pleasant ester smell, *Cladosporium suaveolens* produced a Camembert cheese-like odour, and *Sporobolomyces odor* emitted an intense lactone smell. The predominant volatiles were esters, alcohols and organic acids. JA

154

[The effect of the type of contact surface on the quality of mash distillation products.]

Zaremba, V. K.; Anistratenko, V. A.; Taran, V. M.; Makovei, D. P.

Fermentnaya i Spirtovaya Promyshlennost' No. 8, 26-28 (1976) [5 ref. Ru] [KTIPP, USSR]

The movement of the basic content of volatile matter was studied in relation to the height of the mash column with either mesh or ripple plates, using gas chromatography. Zones of accumulation

and new formation of volatile matter were determined. The total content of esters in the mash distillation product was 6 times lower with ripple plates than with mesh plates, and aldehydes were reduced 1.5 times correspondingly. The formation of new volatile matter during mash distillation needs to be inhibited by reducing the dwell time of the distillation product in the column; ripple plates or possibly the introduction of new contact-type equipment permitting reduction of the dwell time of the liquid in the rectifier would appear to offer considerable prospects for this. STI

155

Methods for determining bitterness, thermal history and flavor quality in citrus products. (In 'The quality and detection of adulteration in citrus juices' [see FSTA (1977) 9 8H1276].) [Lecture]

Berry, R. E.; Nagy, S.; Tatum, J. H.

pp. 53-65 (1976) [En, es] [Citrus & Subtropical Products Lab., Winter Haven, Florida, USA]

Simplified TLC methods for detn. of the bitter principles naringin and limonin in citrus juices are briefly described; untreated whole juice is spotted directly onto commercial TLC plates. Accuracy and

recovery are adequate for routine quality control. A method for testing for thermal abuse of citrus products is briefly described, based on detn. of furfural (at concn. >5 parts/billion) by a method based on concn. of the furfural by distillation, and colorimetric detn. after colour development with aniline. Effects of storage time and temp. on furfural formation are discussed, and the relation between furfural concn. and flavour is considered. Flavour changes were detectable at a furfural concn. of 50-70 $\mu\text{g/l}$ in orange juice, 150-225 $\mu\text{g/l}$ in grapefruit juice. A technique for identification of compounds responsible for off-flavours in canned orange juice is described, based on separation by thick-layer chromatography, detection of spots of interest by smelling the plate, and identification of compounds of interest by GLC. Methods for collection of volatiles from citrus juice headspace samples (for subsequent GLC analysis) are also described. AJDW

156

Separation of pigments, flavonoids, and flavor fractions from citrus oils by gel permeation chromatography.

Wilson, C. W., III; Shaw, P. E.

Journal of Agricultural and Food Chemistry 25 (2) 221-224 (1977) [18 ref. En] [Citrus & Subtropical Products Lab., USDA, Winter Haven, Florida 33880, USA]

Conc. cold-pressed citrus oils and a hexane extract of orange peel were separated into 3 fractions, colour, flavonoid and volatile flavour, by gel permeation chromatography. Yields of pigment from the cold-pressed oils and peel extract, respectively, were as high as 116 and 350 mg/kg peel. Components of the colour fractions from cold-pressed oils and peel extract were separated by TLC and compared. Constituents of the flavonoid fractions were identified by comparison of TLC data with those of authentic samples. 23 components of the volatile flavour fraction from tangerine oil were identified by GLC. 3 esters, citronellyl acetate, decyl acetate, and 1,8-p-menthadien-9-yl acetate, not previously reported as tangerine oil constituents, were among the identified components. AS

157

Objective analysis of volatiles in rice and corn products.

Legendre, M. G.; Dupuy, H. P.; Ory, R. L.; McIlrath, W. O.

Abstracts of Papers, American Chemical Society 173, AGFD 62 (1977) [En] [S. Regional Res. Cent., 1100 Robert E. Lee Boulevard, New Orleans, Louisiana 70179, USA]

Profiles of volatiles of whole rice, milled rice, rice bran, rice bran oil, rice flakes, normal corn high-lysine corn, corn flakes, corn meal, corn oil, and popping corn were obtained by direct gas chromatography. Many of the volatiles were identified by combined gas chromatography/MS.

Although freshly milled rice has small amounts of volatiles, whole rice, rice bran, rice bran oil, and rice flakes have relatively large amounts. The principal ones identified were ethanol, acetone, pentane, hexane, pentanal and hexanal. Whole corn, corn meal, corn oil, and corn flakes also gave large amounts of volatiles that can be measured directly from the samples by this technique without prior volatile enrichment. Ethanol, acetone, ethanethiol, hexanal and others have been identified thus far. This direct and rapid gas chromatographic method should be useful for analysing volatiles associated with flavours and off-flavours in cereal products, particularly for new breeding in cereal products, particularly for new breeding lines of cereal grains after processing and storage. The potential use of this method for analysing stored cereal products such as baby foods, which incorporate large amounts of rice bran, is discussed. AS

158

Simultaneous distillation-extraction of volatiles from hot fats and oils.

Teranishi, R.; Buttery, R. G.; Ling, L. C.

Abstracts of Papers, American Chemical Society 173, AGFD 64 (1977) [En] [W. Regional Res. Cent., Albany, California 94710, USA]

Some odours are generated during heating of adipose tissues, as in the case of lamb. Steam distillation is an effective method for distilling volatiles from oil systems, but the oil system cannot be heated beyond 100°C in the presence of excess water. This system maintains the oil at 150°C for the generation of volatiles, and the water is metered in with a pump. Steam and volatiles are condensed in an extraction head. Volatiles are extracted by ether, which is continuously recycled. Water is not automatically returned to the reaction vessel but is returned to a reservoir which is connected to the pump which controls the rate of recirculation of water. After several hours, when lamb odour is no longer generated from the hot adipose tissues, the recycling of water and ether is stopped. Ether is removed to yield an isolate with a strong lamb odour. AS

159

Methods of analysis of fats and fatty oils. Section 1.10. Determination of moisture and volatile matter.

United Kingdom, British Standards Institution
British Standard BS 684:Section 1.10, 4pp. ISBN 0-580-09375-1 (1976) [En] Price £1.20 [2 Park Street, London W1A 2BS, UK]

3 methods are described: (i) oven method, (ii) open dish method, and (iii) N method. (i) and (ii) are applicable to animal and vegetable fats other than drying, acid and other oxidizable oils containing $\leq 1\%$ water, and (iii) is applicable to all drying, acid and other oxidizable oils containing $\leq 1\%$ water. Fat is heated at $103 \pm 2^\circ\text{C}$ for method (i) and at 103°C for method (ii) until all moisture and

volatile matter are removed. Method (iii) consists of removal of moisture and volatile matter by passing a stream of dry N_2 through the fat, which is supported on asbestos fibre and maintained at a temp. of $50 \pm 2^\circ C$. [See FSTA (1977) 9 8U470 for BS 684:Introduction.] AL

160

Methods of analysis of fats and fatty oils. Section 2.11. Determination of volatile acids (Reichert, Polenske and Kirschner values).

United Kingdom, British Standards Institution
British Standard BS 684:Section 2.11, 4pp. ISBN 0-580-09145-7 (1976) [En] Price £1.20 [2 Park Street, London W1A 2BS, UK]

See FSTA (1977) 9 8U470 for BS 684:Introduction.

161

The adsorption of volatile aroma constituents by foods. VIII. Adsorption of volatile carbonyl compounds by amino acids.

Maier, H. G.; Hartmann, R. U.

Zeitschrift fuer Lebensmittel-Untersuchung und -Forschung 163 (4) 251-254 (1977) [15 ref. En, de] [Inst. für Lebensmittelchem., Tech. Univ., Fasanenstrasse 3, D-3300 Braunschweig, Federal Republic of Germany]

The adsorption of various volatile aldehydes and ketones by 22 dry amino acids was studied. The amounts adsorbed decreased approx. in the order: propanal, diacetyl, hexenal, hexanal, acetone, pentan-3-one, nonan-3-one, undecanal and nonan-5-one, but there were great differences in the adsorption capacity of the amino acids. Lysine adsorbed best and often irreversibly. The adsorption capacity of arginine, histidine, phenylalanine, tryptophan, proline, valine, leucine and isoleucine was very strong. With cysteine, thiazolidinecarboxylic acids were formed. In most cases of adsorption > 100 mmol/mol, except for monoketones, strong discoloration, probably of the Maillard type, was observed. Propanal and hexanal were to a great extent converted to aldol addition and condensation products. Tyrosine and hydroxyproline adsorbed less than the corresponding amino acids without hydroxyl groups. This is attributed to differences in crystal-lattice forces. [See FSTA (1973) 5 10A446 for part VII.] AS

162

[Separation and determination of flavour nucleotides using high pressure liquid chromatography on ion exchangers.] Erfassung geschmacksaktiver Nukleotide mit Hilfe der Hochdruckchromatographie an Ionenaustauschern. Heyland, S.; Moll, H.

Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene 68 (1) 72-77 (1977) [1 ref. De, fr, en]
[Beratungsgesellschaft für Nestle-Produkte AG, La

Tour-de-Peilz, Switzerland]

Separation and detn. by high pressure liquid chromatography of inosine, guanosine and 5-adenylic acid present jointly with other nucleotides in various foods are described. A steel column filled with Vydac AX anion exchanger was used in a Perkin Elmer model 1220 liquid chromatography with a built-in UV monitor working at 254 nm, temp. being $60^\circ C$, elution rate 1.5 ml/min and pressure 58 atm. SKK

163

[Hallertau aroma hops. Comparison of the hop varieties 'Hersbruck Spät' and 'Hallertau Mittelfrüh' as aroma hops from the Hallertau growing region.] Hallertau Aromahopfen. Ein Vergleich der Hopfensorten 'Hersbrucker spät' und 'Hallertau mittelfrüh' als Aromahopfen des Anbaubereiches Hallertau.

Forster, A.

Brauwelt 117 (10) 291-294 (1977) [8 ref. De, en] [Joh. Barth & Sohn, 8500 Nuremberg, Federal Republic of Germany]

The trend towards replacement of the oral-wilt susceptible strain Hallertau Mittelfrüh by the resistant strain Hersbruck Spät is discussed. Comparative data are given for concn. of bitter principles, the concn. and polymerization index of polyphenols and concn. of aroma compounds in the 2 var. It is concluded that Hersbruck Spät is an acceptable substitute for Hallertau Mittelfrüh. TUB-IGB

164

[Analysis of fruit aromas.]

Bricout, J.

Bios 8 (3) 10-15 (1977) [15 ref. Fr] [Inst. de Recherches Appliquées aux Boissons, 120 Avenue Foch, 94003 Creteil, France]

This review-type article deals with general methods of aroma extraction (head-space technique with or without concentration of volatile compounds; steam distillation and extraction; and organic solvent or CO_2 extraction); analysis by gas or liquid chromatography; and identification of aroma constituents by MS or specific GLC detectors. SKK

165

[Aroma recovery and evaporation equipment for fruit pulp.] Aromarückgewinnungs- und Eindampfanlage für Fruchtmark.

Anon.

Industrielle Obst- und Gemüseverwertung 61 (19) 545-546 (1976) [De]

Technical details of the 'Unipectin' combined 3-stage concentrator and aroma recovery system for fruit pulp are described. The initial evaporation stage operates between 85° and $102^\circ C$ according to the nature of the product, and the necessity for a preliminary pasteurization stage is therefore

eliminated. 2nd stage operating temp. is 75-85°C, and 3rd stage is 45-50°C. Conc'n. ratios of 1:2 can be achieved for apricot and peach pulp, while for tomato pulp a ratio of 1:3.25 can be obtained. The equipment is also suitable for concentrating grape and citrus juices. Operating details (e.g. steam and cooling water consumption, evaporative capacity) are tabulated for typical products. Economic benefits arising from the reduced storage capacity needed for concentrated, as opposed to single-strength pulp are quantified approximately. BDH

166

[Gas chromatographic analysis of aroma compounds in high-quality Tokay wines. I. Analysis of volatile neutral constituents by gas chromatography-mass spectrometry.]

Kerenyi, Z.

Borgazdasag 24(3) 101-107 (1976) [15 ref. Hu] [Szöleszeti es Boraszati Kutato Intezet, Hermann Otto ut 15, 1022 Budapest II, Hungary]

Aroma constituents were determined by GLC-MS in samples of 1963 Aszu Tokay, 1972 Esszencia Tokay, 1973 Aszu Tokay, and 1973 Furmint Tokay wines. A table of data is given for the pH and composition of the wines, together with chromatograms and tables of peak areas and MS data for the aroma compounds (esters, alcohols, aldehydes, ketones, acetals, lactones, etc) studied. AJDW

167

[Effects of freezing and related treatments on the volatile components of frozen peaches.]

Paillard, N.

Revue Generale du Froid 67(12) 845-854 (1976) [20 ref. Fr] [Lab. de Physiol. Vegetale Appliquee, Univ. P. et M. Curie, Tour 53-4, Place Jussieu, 75230 Paris Cedex 05, France]

The volatile components of peaches from 2 var. (Michelini, white and Vivian, yellow) frozen to core temp. of -20°C in 1.75, 5-6 or 12-13 h, stored 8-10 months at -22°C with or without an atm. of N₂ and allowed to thaw in air, in N₂ or in a 20% sugar syrup with 0.1% ascorbic acid were analysed by GLC head space analysis. Results, shown graphically and in tables, show marked differences between fresh and frozen peaches. The main differences were the considerable increase in ethanol conc'n. e.g. from 18.3 [units not specified] in fresh Vivian peaches to 71.8, 76.9 and 82.8 in fruit frozen for 1.75, 5-6 and 12-13 h and decrease in hexanal and 2-hexenal (from 7.1 to 3.5, <1 and <1 and from 18.1 to 4.6, 0.43 and 0.08 respectively). The differences are attributed to metabolic processes during the freezing procedure, prior to inactivation of enzymes. The storage atm. and thawing methods had no significant effect on the conc'n. The reduction in conc'n. of the 2 aldehydes was due to the removal of surface layers by lye-peeling. RM

168

Volatile constituents of white bread crust.

Folkes, D. J.; Gramshaw, J. W.

Journal of Food Technology 12(1) 1-8 (1977) [17 ref. En] [Lord Rank Res. Cent., High Wycombe, Bucks HP12 3QR, UK]

A table is given of 190 volatile components identified (in almost all cases except carboxylic acids and phenol by GLC/MS) in essences prepared from white bread crust (in 20 cases the identification is provisional only); of these compounds, 96 have not previously been reported as constituents of white bread. A limited number only, of the compounds now reported, may be partially responsible for the crusty notes which are present in bread aroma. AS

169

[The taste compounds of fermented *Acetes chinensis*.]

Chung, S. Y.; Lee, E. H.

Bulletin of the Korean Fisheries Society 9(2) 79-110 (1976) [108 ref. Ko, en] [Geongsang Nat. Univ., Jinju, Korea]

ADP, AMP and IMP tended to degrade rapidly while hypoxanthine increased remarkably at 27-day fermentation, but slightly decreased at 72-day fermentation. Lysine, alanine, glutamic acid, proline, glycine and leucine were abundant in both fresh samples and fermented products. The increase of total free amino acids during 72-day fermentation reached approx. 2 or more times that of fresh samples. The amount of betaine increased during fermentation and reached a max. at 72-day fermentation. Trimethylamine (TMA) increased while TMA oxide decreased during fermentation. It is concluded that the most important taste compounds of fermented small shrimp, *Acetes chinensis*, were amino acids such as lysine, proline, alanine, glycine, serine, glutamic acid and leucine. KoSFoST

170

[Volatile sulphur compounds in meat, and their precursors.] [Review]

Barylko-Pikielna, N.; Mielniczuk, Z.; Daniewski, M.

Roczniki Instytutu Przemysłu Mięsnego i Tłuszczowego 13, 67-78 (1976) [36 ref. Pl, ru, en] [Inst. Żywności i Żywnienia, Zakład Tech. Żywności, Poland]

A comprehensive review of literature sources concerning the contribution of volatile S compounds to meat flavour is made. In particular, the impact of compounds such as H₂S, mercaptans, sulphides and heterocyclic S compounds is discussed, showing the method of their synthesis from the precursors during heat treatment of meat. Free amino acids, sugars, and thiamin are the main

precursors mentioned. None of the S compounds discussed showed typical meat aroma; it was suggested that meat aroma is rather the result of mutual influence of a number of volatile compounds. The reviewed literature sources strongly suggest that the only promising methodological approach to the study of the role of particular compounds in overall meat aroma is a complex approach covering both sensory analysis, combined chromatographic/sensory investigations and mass spectrometry, with sophisticated statistical methods for interpretation of the data obtained.
AS

171

Volatile constituents of an alcoholic extract of juniper berry.

Taskinen, J.; Nykänen, L.

International Flavours and Food Additives 7 (5) 228, 233 (1976) [17 ref. En] [Res. Lab. of the State Alcohol Monopoly (Alko). Box 350, SF-0010 Helsinki 10, Finland]

Juniper berry (*Juniperus communis* L.) distillate was prepared by percolating Italian berries with an alcohol-water mixture and distilling the percolate under reduced pressure. For analysis the essential oil was separated from the alcoholic solution by extraction with pentane. The chemical composition of the distillate was investigated by GC, IR spectrophotometry and MS. Compounds identified are tabulated together with the % present. 14 monoterpene alcohols, 8 ethyl ethers of monoterpene alcohols, 4 ethyl esters of long chain fatty acids and 4 other compounds were identified.
VJG

172

Nature and origin of volatile flavour components of onion and related species. [Review]

Freeman, G. G.; Whenham, R. J.

International Flavours and Food Additives 7 (5) 222-227, 233 (1976) [52 ref. En] [Nat. Vegetable Res. Sta., Wellesbourne, Warwick CV35 9EF, UK]

The topic is reviewed under the following headings: precursors of *Allium* flavour components; preparation of alliinase; methods of assay of the flavour intensity of *Allium* sp.; recent studies on factors that influence *Allium* flavours based on the above methods (factors operating during growth, flavour changes during overwinter storage, flavour changes resulting from some post-harvest processes); distribution of flavour components in *Allium* spp.; survey of the S-alk(en)yl-L-cysteine sulfoxides present in *Allium* spp. and a classification based thereon; simulation experiments; biosynthesis of flavour precursors; and note on use of some *Allium* spp. as foods.
VJG

173

Vanilla volatiles - a comprehensive analysis.

Klimes, I.; Lamparsky, D.

International Flavours and Food Additives 7 (6) 272-273, 291 (1976) [11 ref. En] [Givaudan Res. Co. Ltd., CH-8600 Dubendorf, Switzerland]

Volatiles of commercially available, cured Bourbon vanilla beans from Madagascar were collected in a special apparatus developed by Hrivnac for headspace analyses, by adsorption on a modified charcoal filter, elution with carbon disulphide and analysis by GLC methods. In addition the high-vacuum transfer technique was employed i.e. vanilla was subjected to heating (60°C) under high vacuum (0.001 torr) in a closed system, the distillable material being collected in a receiver cooled with liquid N₂. Solvent extraction was also used. 170 compounds identified in vanilla flavouring concentrates are tabulated. Most are present at a concn. < 1 ppm in the beans. VJG

174

Separation and quantitative determination of traces of carbonyl compounds as their 2,4-dinitrophenylhydrazones by high-pressure liquid chromatography.

Selim, S.

Journal of Chromatography 136 (2) 271-277 (1977) [12 ref. En] [FMC Corp., Agric. Chem. Div., 100 Niagara Street, Middleport, New York 14105, USA]

Trace amounts of carbonyl compounds are of importance in vegetable flavouring, aroma of commercial beverages, etc. A method for the quantitative conversion of traces of aldehydes and ketones to their 2,4-dinitrophenylhydrazones at room temp. is presented. The 2,4-dinitrophenylhydrazones of a number of aliphatic and aromatic carbonyl compounds were prepared. The compounds were separated on a reversed-phase μ Bondapak C18 column. The method is valuable in the quantitative detn. of traces of low mol. wt. aldehydes and ketones. Derivatives of identical mol. wt. can be easily separated by high-pressure liquid chromatography but not by gas chromatography under the conditions tried. AS

175

Correlations of flavour score with volatiles of oilseeds products.

Dupuy, H. P.

Oil Mill Gazetteer 81 (10) 32-33 (1977) [En] [S. Regional Res. Cent., USDA, New Orleans, USA]

The application of direct GLC to detn. of residual solvents and trace amounts of naturally occurring volatiles in oilseed products is reported. Analysis of soybean, cottonseed, peanut and corn oils evaluated by taste panels after deodorization and again after storage gave good to excellent correlations with pentanal, hexanal, decadienal and pentane contents at the 99% level. A simplified

procedure has also been devised for analysing peanut butter: a glass rod is twisted in the peanut butter to pick up 0.2-0.3 g. the rod with adhering sample is inserted into the GLC injection port liner, plugged with glass wool and volatiles are eluted by heating the injection port. Analysis of several series of commercial peanut butters revealed that

methylpropanal was strongly correlated with flavour and aroma, hexanal with off-flavour and staling. Multiple linear regression analysis of the major volatile peaks gave correlations of $r = 0.49-0.94$ (at the 99% level) for each of the commercial brands examined. RM

176

[Determination of coumarin by high pressure liquid chromatography.] Zur Bestimmung von Coumarin mittels Hochdruckflüssig-Chromatographie. Benk, E.; Treiber, H.

Alkohol-Industrie 90 (7) 135-136 (1977) [5 ref. De]

Coumarin was determined by high-pressure liquid chromatography in samples of Polish Zubrowka vodka (flavoured with stems of grasses of the genus *Hierochloe*). The analysis was conducted on a Hewlett-Packard 1010B chromatograph, using a Merck RP8 column and a methanol/water (4:6) mobile phase. Flow rate was 1 ml/min; pressure was approx. 180 bar. Coumarin was detected in the eluate by UV spectrophotometry at 254 nm. This method gave a mean coumarin concn. of 10.9 mg/l. in the vodka; this result agrees well with the value of 11.0-11.5 mg/l. determined by GLC. The legal and toxicological aspects of these concn. of coumarin in vodka are briefly discussed. AJDW

177

[Precursors of colour and aroma formation in coffee.] Vorstufen und Entstehung von Farbe und Geschmack des Kaffees. (In '7th International Colloquium on the Chemistry of Coffee' [see FSTA (1977) 9 10H1670].) [Lecture]

Baltes, W.

pp. 91-107 (1976) [44 ref. De, en] [Tech. Univ., Berlin (West)]

It is suggested that coffee aroma does not depend solely on bean var. or method of preparing the beverage; changes during roasting are also of importance. Chemical changes during roasting of green coffee are discussed in detail, including: breakdown of sucrose, an initial increase of reducing sugars being followed by their breakdown; decomposition of chlorogenic acid to quinic acid, followed by further decomposition; decomposition of caffeic acid; reduction of free amino acids and their breakdown products due to pyrolysis or Strecker degradation; hydroxymethylfurfural formation by heating of the sugars; and the glucose-

alanine reaction and products of the Amadori reaction. In general, monosaccharides (even in low concn.) and amino acids are the main aroma precursors, followed to a lesser extent by chlorogenic acid. The final decomposition products include > 300 volatile compounds; it is believed that the aroma compounds associated with Maillard-Strecker browning are of minor significance and that pyrolytic decompositions are the major factor, for which roasting temp. are sufficiently high.

ELC

178

[Volatile components of raw coffee.] Flüchtige Inhaltsstoffe des Rohkaffees. (In '7th International Colloquium on the Chemistry of Coffee' [see FSTA (1977) 9 10H1670].) [Lecture]

Vitzthum, O. G.; Werkhoff, P.; Ablanque, E. pp. 115-123 (1976) [14 ref. De, en] [HAG AG, Bremen, Federal Republic of Germany]

Volatile components of green coffee were extracted by steam distillation, by CO_2 under pressure and above its critical temp. of 31°C (details given), with further extraction by diethyl ether, separation into neutral and basic fractions and identification of individual compounds by GLC and MS. 18 compounds not previously reported in coffee (furans, phenols, aldehydes, alcohols and pyrroles) were identified in the neutral fraction. A further 37 new compounds were identified in the basic fraction (16 not found hitherto in roasted coffee); these included pyridines, quinolines, aromatic amines, pyrazines, esters and aldehydes. The pyrazines (16 compounds) were very prominent, and it is considered that 4 methoxypyrazines are largely responsible for the aroma of raw coffee, particularly 2-methoxy-3-isobutylpyrazine, which is known to be retained after roasting. ELC

179

[Study of properties of green coffee by differential thermal analysis and mass spectrometry.] (In '7th International Colloquium on the Chemistry of Coffee' [see FSTA (1977) 9 10H1670].) [Lecture]

Quijano-Rico, M.; Bautista R., E.; Chaparro B., F.; Zamudio G., V.; Ortiz P., A.; Helden, J. von pp. 125-131 (1976) [5 ref. Es, en] [Lab. de Investigaciones sobre la Quimica del Cafe, Bogota, Colombia]

Equipment used (described and illustrated) included a differential thermal analyser (DTA), selective ion monitoring device and a mass spectrometer. The 3 methods were used to study the volatile compounds evolved during roasting (pyrolysis) of green coffee in a current of He (100 ml/min), the coffee grains being heated from 30° to 300°C at $10^\circ/\text{min}$. All 3 methods indicated phases classed as evolution of water, 'furfural' compounds and 'pyrazine' compounds, which coincided with irregularities in the DTA curves. However, variations were found in the DTA curves (including differences between portions of the same sample), according to the coffee moisture content and

particularly between the Arabica and Robusta coffee var. DTA curves for Arabica coffee were generally similar to those described previously in the literature. ELC

180

[Flavour substances in coffee.] Geschmacksaktive Substanzen in Kaffee. (In '7th International Colloquium on the Chemistry of Coffee' [see FSTA (1977) 9 10H1670].) [Lecture]

Belitz, H. D.

pp. 243-252 (1976) [22 ref. De, en] [Tech.

Univ., Munich, Federal Republic of Germany]

A review is presented of existing knowledge of chemical compounds associated with the basic sour, salty, sweet and bitter flavours. The flavour components of roasted coffee, classed as a mixture of sour, bitter and aromatic, are believed to be derived mainly from the effects of heat on organic constituents. Constituents which possibly make up the sour fraction are listed. Bitter constituents include caffeine, together with various heterocyclic compounds of pyridine and pyrrole formed by heating of trigonellin, and also various aliphatic and aromatic ketones and esters. Trigonellin itself has little direct influence on flavour. Some repression of bitterness is reported by L-aspartyl-L-phenylalanine-methyl ester in the presence of sucrose. ELC

181

[Flavour components of beer.] [Review]

Kumada, J.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 71 (11) 819-830 (1976)

[225 ref. Ja] [Santory Cent. Res. Inst., Osaka, Japan]

This review covers alcohols, esters, carbonyl compounds, and volatile S compounds in beer, with emphasis on their origins, contents, organoleptic properties and analytical methods. YN

182

[Lipids and beer quality - a review.] Lipide und Bierqualität - eine Übersicht. [Review]

Forch, M.

Monatsschrift für Brauerei 30 (5) 124, 126-128, 130-135 (1977) [59 ref. De] [Versuchs- & Lehranstalt für Brauerei, Seestrass 13, D-1000 Berlin (West) 65]

Aspects considered in this review on effects of lipids on beer quality include the following: effects of lipids on foam retention (with reference to tables of literature data for effects of various lipid fractions, fatty acids and fatty acid esters); effects of lipids on the flavour and aroma of beer (with reference to direct effects, and the role of lipids as precursors of aroma compounds); changes in lipids during various stages of the malting and brewing process; the importance of unsaturated fatty acids for yeast metabolism; and the potential for reduction of the content of free short-chain fatty acids in beer. AJDW

183

Investigation of beer by chromatography and high vacuum sublimatography.

Dadic, M.; Belleau, G.

Proceedings, American Society of Brewing Chemists 33 (4) 159-166 (1975) [5 ref. En]

[Molson Breweries of Canada Ltd., Montreal, Quebec H2L 2R5, Canada]

High vacuum sublimation (HVS) has been developed for the investigation of low-volatility beer constituents. A number of beers, identified as ales and lagers, both fresh and aged, were lyophilized and the dried solids subjected to the HVS procedure yielding characteristic sublimatograms. The same beers were injected directly onto an OD-Sil-X-1 RP column and the high pressure liquid chromatograms developed with water as eluant. Characteristic patterns were obtained for various ales and lagers, both fresh and aged. High pressure liquid chromatography of the beer solids, their sublimates, and the nonsublimated residues was compared with the chromatograms of the phenolic acids recorded under identical conditions. Further investigation of the sublimates was performed by GLC, and the positions of several phenolic acids were located. Characteristic flavours of the sublimates and the trap volatiles were also recorded. Some typical chromatograms are given. AS

184

[Tannin in persimmon (*Diospyros kaki* L.) fruits. II. Volatile compounds and soluble tannin of the fruits during removal of astringency.]

Kusumoto, M.; Yoshimura, F.

Journal of the Japanese Society for Horticultural Science 45 (1) 76-80 (1976) [14 ref. Ja, en]

[Fac. of Agric., Kochi Univ., Kochi, Japan]

Using 4 astringent cultivars of persimmon fruits, changes in contents of soluble tannin and some volatile compounds were determined in relation to the process of removal of astringency. While various treatments are known to be effective for removing astringency, the methods used in this study were as follows: drying at ambient temp. after peeling, dipping in warm water (40°C) for 24 h, freezing at -30°C for 2 months, and storing at room temp. for sufficient days to ripen to a soft consistency. When the fruits were softening and losing astringency during the treatments, except for frozen ones, soluble tannin content decreased rapidly, and alcohols and acetaldehydes increased.

About the time when the contents of these volatiles reached a max. the fruits became non-astringent. In fruits which had their astringency removed, contents of tannin cells were already coagulated and shrunk. Production of alcohols preceded that of acetaldehyde and was dominant in quantity among the volatiles. Ethanol was applied to pulp-slices or squeezed-juice and the reaction was observed microscopically, but no coagulating effect was found even at high alcohol concn. Therefore it is unlikely that the alcohols have a direct effect, and

an accumulation of acetaldehyde even at a low level would play an important role in coagulation of tannin and thus removal of astringency as reported previously. AS

185

[Volatile components in the aroma of virgin olive oil.]

Olias, J. M.; Barrio, A. del; Gutierrez, R.
Grasas y Aceites 23 (2) 107-112 (1977) [11 ref.
Es, de, en, fr] [Inst. de la Grasa y sus Derivados,
Seville, Spain]

The volatile aroma components of virgin olive oil swept by N_2 were collected on active carbon, extracted with carbon disulphide, isolated and identified by GLC and MS. 13 hydrocarbons, 9 alcohols, 3 aldehydes, 3 ketones, 5 esters and 1 ether were identified and are shown in a table. AS

186

Essential oils and related products. [Review]
Guenther, E.; Gilbertson, G.; Koenig, R. T.
Analytical Chemistry 49 (5) 83R-98R (1977)
[632 ref. En] [Fritzsche Dodge & Olcott Inc., New
York, New York 10011, USA]

This is the 16th in a series of reviews of the analysis of essential oils and related products. The literature from Sept. 1974 to Aug. 1976 (inclusive) is covered under the same headings as in the previous review [see FSTA (1975) 7 9T414].
DIH

187

Extraction method for odour and flavour producing ingredients of foods and flowers, and products produced.

Asahi Kasei Kogyo Co. Ltd.
British Patent 1 458 628 (1976) [En]

The method involves contacting the flavour-producing foods or flowers with liquid dimethyl ether, with or without water, at below -25°C at standard pressure, or at >4 atm gauge at above $+25^\circ\text{C}$ (or at temp. and pressures between the 2); and removing the dimethyl ether and water, if present, by evaporation. Spices, herbs, coffee, tea, dried bonito, roast meat, egg yolk, and genera of Rosaceae, Oleaceae and Compositae flowers can be treated by this method. HBr

188

Essential oils - preparation of test sample.
International Organization for Standardization
International Standard ISO 356-1977, 1p. (1977)
[En]

189

[Essential oils. Principles of nomenclature.]
France, Association Francaise de Normalisation
(AFNOR)

French Standard N F T 75-034, 3pp. (1976) [Fr]

Rules for nomenclature of essential oils are given. Aspects covered include: common names; botanical names; the principal chemical constituent; nomenclature of oils from interspecific hybrids; varieties or clones used; plant part used; country and/or region of origin; and method of extraction.
AJDW

190

[Essential oils. Determination of the content of free primary and secondary alcohols by acetylation in pyridine.]

France, Association Francaise de Normalisation
(AFNOR)

French Standard N F T 75-106, 3pp. (1976) [Fr]

This standard, which replaces the standard of the same number published in 1968, prescribes a procedure for detn. of free primary and secondary alcohols in essential oils. Primary and secondary alcohols in a 1 g sample of the oil under test are acetylated by heating for 1 h (in a boiling water bath) in the presence of 5 ml of an acetic anhydride/pyridine mixture (1:3 v/v). The excess acetic anhydride is then hydrolysed by addition of 40 ml of water; the acetic acid formed is then determined by titration against a 0.5N solution of KOH in 95% ethanol, using phenolphthalein indicator. Instructions for calculation of the free alcohol content of the sample are given. AJDW

191

[Essential oils. Preparation of samples for analysis.]
France, Association Francaise de Normalisation
(AFNOR)

French Standard N F T 75-110, 2pp. (1976) [Fr]

This standard (which replaces the standard of the same number published in 1964) prescribes a procedure for preparation of samples for subsequent analysis. The essential oil (melted if necessary) is dried by holding in contact with approx. 15% by wt. of MgSO_4 or Na_2SO_4 for approx. 2 h; insoluble material is then separated by filtration. AJDW

192

[Aromatic constituents of flavouring extracts from herbs, spices and drugs. VIII.] Die Aromastoffe der natürlichen Würzessenzen aus Kräutern Gewürzen und Drogen. VIII.
Oberdieck, R.

Alkohol-Industrie 90 (7) 136-140 (1977) [De]
[Stettiner Strasse 62, D-8650 Kulmbach, Federal
Republic of Germany]

The botanical characteristics, main areas of production, composition, main flavour constituents and applications of cloves, capers, saffron and cassia are discussed. [See FSTA (1977) 9 7T409 for the preceding part.] TUB-IGB

93

apparatus for the isolation of trace volatile constituents from foods. [Lecture]

Chang, S. S.; Vallese, F. M.; Hwang, L. S.; Hsieh, J. A. L.; Min, D. B. S.

Journal of Agricultural and Food Chemistry 25 (3) 50-455 (1977) [8 ref. En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

For ascertaining the chemical structures of the trace volatile constituents responsible for the flavour of foods, isolation of such components without contamination or artifacts while maintaining the genuine flavour of the original food is a necessary prerequisite for sophisticated instrumental methods of fractionation and identification. Techniques for the isolation of such flavour constituents from oil, aqueous solutions and solid masses, both in small quantities and in relatively large amounts, were successfully developed, and the apparatus for each technique is described in detail. [See FSTA (1977) 9 11A674.]

AS

194

Isolation of volatile components from a model system. [Lecture]

Schultz, T. H.; Flath, R. A.; Mon, T. R.; Eggling, S. B.; Teranishi, R.

Journal of Agricultural and Food Chemistry 25 (3) 446-449 (1977) [12 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

A description is given of a modification of the Likens & Nickerson apparatus for isolating volatiles from foods, beverages and other agricultural products by simultaneous steam distillation and extraction (SDE) with an organic solvent. The new apparatus was evaluated by experiments with dilute aqueous solutions of a model mixture of 12 volatile compounds, representative of those found in fruit essences. Analysis of the recovered material was done by quantitative gas chromatography.

Recoveries of the compounds are tabulated for variations in time, pressure, vol. of solvent, solvent and pH. Hexane was shown to be an excellent extracting solvent for most of the components except low mol. wt., water-soluble compounds (ethanol and ethyl acetate, which form azeotropes with hexane). For these compounds, diethyl ether gave considerably better results. [See FSTA (1977) 9 11A674.] AS

195

Gas stripping, sorption, and thermal desorption procedures for preconcentrating volatile polar water-soluble organics from water samples for analysis by gas chromatography.

Kuo, P. P. K.; Chian, E. S. K.; DeWalle, F. B.; Kim, J. H.

Analytical Chemistry 49 (7) 1023-1029 (1977) [23 ref. En] [Environmental Eng., Civil Eng. Dep., Univ. of Illinois, Urbana, Illinois 61801, USA]

The efficiencies of the removal of organic

compounds from aqueous solution by gas stripping, the adsorption of the stripped organics on Tenax-GC adsorbent and the thermal desorption of the organics from the adsorbent were determined using volatile polar water-soluble organics as the principal model compounds. Good mixing between the stripping gas and the liquid phase being stripped, as provided by the Bellar & Lichtenberg stripping apparatus, resulted in the effective removal of organics. Stripping the compounds at an elevated temp. is suggested. Breakthrough and displacement of lower alcohols occurred on the Tenax-GC. The adsorption and the desorption efficiencies are better than 75% and 80%, respectively, for the majority of the compounds studied. A discussion is included of the procedures for gas stripping, sorption, and thermal desorption to achieve a reliable analytical method for determining volatile polar water-soluble organics in water by gas stripping/gas chromatographic analysis. The detection limits are at the parts/billion level or lower for most of the compounds studied. AS

196

[Colorimetric determination of volatile acids in wine.]

Dima, F.; Ghimicescu, G.

Annales des Falsifications et de l'Expertise Chimique 70 (749) 35-38 (1977) [8 ref. Fr] [Fac. de Pharmacie a Iassy, Romania]

A previously reported [Dima et al. (1972) thesis, Univ. Iassy, Romania, 74-98] simple and quick colorimetric method was modified for use in determining the content of volatile acids in wine (after removal by steam distillation). In the modification ammonium metavanadate was used as reagent and the resulting yellow polyvanadate compound was measured by colorimetry/spectrophotometry. Results, expressed as g H₂SO₄/l. wine, tallied closely with those obtained by the volumetric Ba(OH)₂ method (difference, 0.003 g/l). KME

197

[Changes in readily volatile substances in white table wines during storage.]

Spirov, N.; Goranov, N.

Lozarstvo i Vinarstvo 26 (2) 22-30 (1977) [10 ref. Bg]

Changes in the readily volatile substances contributing to bouquet formation were studied in 8 types of white wine during storage for 8 months. The aromatic substances were separated by Bertrands method, followed by gas chromatography. The biochemical processes continued even after the end of the alcoholic fermentation; the bouquet and aroma continued maturing, and the organoleptic properties improved. During storage, esterification occurred and the ethyl formate concn. increased, as did the concn. of isobutyl acetate, hexyl acetate, ethyl capronate and ethyl lactate. The higher alcohols remained practically constant; in the majority of the

wines, the propanol and octanol concn. declined and the amyl alcohol and hexanol concn. increased. STI

198

(6E,2E) and (6Z,2E)-6-(but-2-enylidene)-1,5,5-trimethylcyclohex-1-ene: important volatile constituents of the juice of the purple passion fruit (*Passiflora edulis* Sims).

Whitfield, F. B.; Sugowdz, G.; Casimir, D. J. *Chemistry and Industry* No. 12, 502-503 (1977) [11 ref. En] [Food Res. Lab., CSIRO, Div. of Food Res., PO Box 52, N. Ryde, NSW 2113, Australia]

The isolation of the 2 title odorants, with aromas variously described as 'rose' or 'raspberry-like', is reported. In fresh juice these (E,E)- and (Z,E)-isomers were detected in concn. of 0.04 and 0.03 ppm respectively. Dilute aqueous solutions of the synthetic isomers had odour thresholds of about 1 part in 10^7 . Both isomers in the pure state are extremely unstable in the presence of O_2 , and their instability accounts for their disappearance from pasteurized juice. [See also FSTA (1973) 5 1J144.] AL

199

The enzymic degradation of lipids resulting from physical disruption of cucumber (*Cucumis sativus*) fruit.

Galliard, T.; Matthew, J. A.; Fishwick, M. J.; Wright, A. J.

Phytochemistry 15 (11) 1647-1650 (1976) [25 ref. En] [Agric. Res. Council, Food Res. Inst., Colney Lane, Norwich NR4 7UA, UK]

Homogenization of fresh tissue from cucumber fruits results in a loss of endogenous lipid catalysed by acyl hydrolase enzymes. Deacylation of lipids is not accompanied by accumulation of free fatty acids. The levels of both saturated (mainly palmitic) and polyunsaturated (linoleic and linolenic) fatty acids in the lipids are reduced. Losses of the major acyl lipid constituents of cucumber (triacylglycerols and phospholipids) are mainly responsible for the observed hydrolysis. Triacylglycerol acyl hydrolase (lipase), phospholipase D and polar lipid acyl hydrolase enzyme activities were demonstrated. It is suggested that hydrolytic attack on endogenous lipids is the initial event on disruption of cucumber tissue, in the formation of lipid degradation products, amongst which are the volatile carbonyl compounds responsible for the characteristic flavour of cucumber. AS

200

A new strategy for the analysis of complex flavors. [Lecture]

Teitelbaum, C. L.

Journal of Agricultural and Food Chemistry 25 (3) 466-470 (1977) [4 ref. En] [General Foods Corp., Tech. Cent., Tarrytown, New York 10591, USA]

The problem of isolating the components of very complex flavours can be approached by the

sequential use of separation techniques in which each step uses a different set of physical properties to effect separation. Thus, one can successively use adsorption (silica gel chromatography), partition between 2 phases (normal or reversed phase partition chromatography), and vapour pressure (gas chromatography). An isolation scheme based on this concept is presented, and its application to the analysis of cocoa butter is demonstrated and illustrated with each type of chromatogram. [See FSTA (1977) 9 11A674.] AS

201

Steam distillation-solvent extraction recovery of volatiles from fats and oils. [Lecture]

Teranishi, R.; Murphy, E. L.; Mon, T. R.

Journal of Agricultural and Food Chemistry 25 (3) 464-466 (1977) [4 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

This system combines steam distillation and liquid-liquid extraction to recover volatiles from fats and oils. Oil is pumped in at the top of a spinning-band distillation column, in which the oil is heated to 100°C and spread to a thin film. As the oil film drops down to the pot, steam, which is introduced at the bottom, travels upward to strip the volatiles from the oil. The steam distillate is extracted in a liquid-liquid extractor incorporated in the system, and the extracted water is recycled as steam. Stripped oil in the pot serves as a liquid seal to force steam up the column. The level of the oil in the pot is maintained automatically by an overflow system. Many l. of oil can be pumped through this system to be stripped of volatiles by steam. The volatiles can be isolated easily from the small amount of solvent recycled in the liquid-liquid extractor. [See FSTA (1977) 9 11A674.] AS

202

Volatile components of crude palm oil.

Dirinck, P.; Schreyen, L.; Schoenmacker, L. de; Wychuyse, F.; Schamp, N.

Journal of Food Science 42 (3) 645-648 (1977) [20 ref. En] [Lab. of Organic Chem., Fac. of Agric. Sci., State Univ. of Ghent, Coupure 533, B-9000 Gent, Belgium]

This paper reports on a gas chromatographic-MS examination of volatile trace constituents, isolated from palm oil by codistillation with water. Aromagrams indicated trans-2-octenal, n-nonanal, trans-2-decenal, trans-2-undecenal, β -ionone and especially trans,cis-2,4-decadienal and trans,trans-2,4-decadienal to be important contributors to palm oil flavour. The volatile compounds identified in palm oil are tabulated. IFT

203

[Aroma-producing substances in Grana cheese. I. Methyl ketones.]

Piergiorganni, L.; Volonterio, G.

Industria del Latte 13 (1) 31-46 (1977) [21 ref. It, en] [Istituto di Industrie Agrarie, Univ., Milan, Italy]

Methyl ketones isolated from normal Grana cheese fat and analysed by high-pressure liquid chromatography showed approx. the same % distribution of individual ketones (C3-C15) as those isolated from cheese fat which had been heated for 16 h at 120°C to liberate all the ketones from their precursors. Acetone, however, constituted a much higher proportion of the total methyl ketones in the unheated than in the heated cheese fat (31.5 vs. 0.7%). Similar studies on heated and unheated fat from raw bulk milk showed that the proportions of methyl ketones isolated from the heated milk fat were very similar to those isolated from the heated cheese fat; in the case of the unheated milk fat, however, the proportions were quite different from those in the heated fats and in the unheated cheese fat. The unheated milk fat contained relatively high proportions of the C4, C6, C8, C13 and C15 ketones. The concn. of the individual methyl ketones in the mature Grana cheese were well below the average flavour thresholds of Langer [see *Journal of Dairy Science* (1964) 47 (6) 677-678] but the total concn. of methyl ketones (3.348 ppm) exceeded the threshold for mixed ketones (1.55 ppm). ADL

204

Cheddar cheese aroma - the effect of selectively removing specific classes of compounds from cheese headspace.

Manning, D. J.; Price, J. C.
Journal of Dairy Research 44 (2) 357-361 (1977)
[9 ref. En] [Nat. Inst. for Res. in Dairying,
Shinfield, Reading RG2 9AT, UK]

An apparatus for removing compounds from cheese headspace and for smelling the entrained volatiles is described; Millipore filters impregnated with lead acetate, mercuric cyanide, mercuric chloride and Na_2CO_3 were used to trap H_2S , $\text{H}_2\text{S} +$ thiols, thiols + sulphides, and volatile acids respectively. 10-month mild, but mature, Cheddar cheese was used, and the panel consisted of 7 experienced Institute staff. Results indicated that a thiol, probably CH_3SH , is essential to Cheddar cheese aroma. The presence of H_2S is beneficial, though possibly not essential, to the flavour. The volatile acids did not appear to make any contribution to Cheddar aroma, but they may affect the cheese taste. DMK

205

The flavor of Swiss cheese. [Lecture]
Biede, S. L.; Hammond, E. G.
Journal of Dairy Science 60 (suppl. 1) 41 (1977)
[En] [Iowa State Univ., Ames, Iowa 50010, USA]

In 7 Swiss cheeses, the flavours of (i) the water-soluble volatile fraction were caused by acetic, propionic and butyric acids and diacetyl, those of (ii) the water-soluble non-volatile fraction by amino acids, peptides, lactic acid, NaCl , Ca^{2+} and Mg^{2+} , and those of (iii) the oil-soluble fraction primarily by short chain fatty acids. Flavour profiles revealed that the most preferred cheeses had a complex flavour with each flavour note present in

relatively equal intensity. Sweet flavour appeared in (ii) and nutty flavour in (iii). [See FSTA (1977) 9 11P1719.] DMK

206

Flavour research in the ARC.

Land, D. G.

ARC Research Review 3 (1) 5-8 (1977) [En]
[Food Res. Inst., Norwich, UK]

Brief discussions are given of current studies on food flavour, conducted by Agricultural Research Council research establishments. Foods considered include meat, dairy products, fruit, fermented beverages, vegetables, poultry, eggs, and fats and oils. AJDW

207

[Constituents of food aromas.]

Dubois, P.

Annales de la Nutrition et de l'Alimentation 30 (2/3) 341-348 (1976) [Fr, en] [Sta. de Tech. des Produits Vegetaux, INRA BV 1540, 21034 Dijon Cedex, France]

The highly volatile compounds present in all foods seem to be responsible for freshness, and the heavier, less volatile compounds for the characteristic flavour. These compounds have very different olfactory detection thresholds: the characteristic components are often those with very low thresholds, present at very low concn. New analytical techniques have allowed identification of >2000 compounds, often present at <1 g/t food. The analytical data have been correlated with olfactory impression in a few cases, e.g. for off flavours. Some examples are given of the origins of the flavour components in raw fruits and vegetables and in fermented or cooked foods. RM

208

[Flavour research.] Forschung auf dem Gebiet der Aromen.

Schudel, P.

Chimia 31 (4) 155-162 (1977) [24 ref. De]
[Givaudan Forschungsgesellschaft AG, CH-8600
Dübendorf, Switzerland]

This paper reviews analytical methods for detecting flavours, including glass capillary GLC, the Klimes injector for micro-GLC and headspace analysis, and macro-headspace analysis coupled with MS-GLC illustrated by analysis of the natural vanilla pod aroma. The synthesis of 3 flavour compounds is briefly explained, viz. pear ester (2-trans-4-cis-decadienoic acid ethyl ester), theaspirane and furfuryl-methyl-disulphide. RM

209

Identification of the important contributors of the aroma of foods.

Nursten, H. E.

Proceedings of the Analytical Division of the Chemical Society 13 (7) 214-215 (1976) [10 ref. En] [Procter Dep. of Food & Leather Sci., Univ. of Leeds, LS2 9JT, UK]

Various methods used to identify volatile components of food flavours are very briefly reviewed, including porous-layer open-tubular (PLOT) columns, headspace sampling, organoleptic assessment by sniffing chromatograms at an odour port, and trapping either on PLOT Celite capillaries and dissolving in a small amount of water, or on lactose and incorporating into foods. RM

210

A convenient method for multiple extraction of volatile flavor components from food slurries and pulps using a two-chambered glass bomb extractor and dichlorodifluoromethane (Freon 12) solvent. Newton Blakesley, C.; Loots, J.

Journal of Agricultural and Food Chemistry 25 (4) 961-963 (1977) [8 ref. En] [Nat. Food Res. Inst., Council for Sci. & Ind. Res., Pretoria 001, South Africa]

A 2-chambered glass 'bomb' apparatus was designed for multiple extraction of volatile flavour components from food slurries and pulps. The solvent, Freon 12, is low boiling (-29°C) and relatively inert and at no time during the extraction or concn. process is the food, solvent, or extract warmed above room temp. Using this method, extracts of good reproducibility and high organoleptic quality from various fruit pulps were obtained. AS

211

[Extraction procedures for flavouring substances from flavoured food products.]

Berner, C.

Annales des Falsifications et de l'Expertise Chimique 69 (746) 737-744 (1976) [5 ref. Fr] [11 Boulevard James-Fazy, 1201 Geneva, Switzerland]

Methods of extracting flavour compounds from foods are reviewed, and investigated by means of model solutions. The recoveries of 1 ppm, 20 ppm and 50 ppm n-butyl acetate, butyrate and hexanoate, ethyl benzoate, α -ionone, n-hexanol, methylphenylcarbinol and dihydrocoumarin from a 30% sugar syrup was studied with 4 solvents and 5 types of extraction apparatus. Best results for aqueous phases were obtained with dichloromethane (followed by chloroform and an ether-pentane mixture) extraction for 10 h: mean % recovery with a percolator for the 3 concn. was 85, 88 and 94% respectively. Steam distillation under atmospheric pressure gave rather poor results, but they were improved by 2-stage steam distillation under reduced pressure (% recovery of 47, 60 and 67 improved to 80, 87 and 95). Recommended methods of extraction for various categories of products (non-alcoholic, non-fatty; non-alcoholic, fatty; alcoholic, fatty or non-fatty; liquid or solid) are tabulated, 2-8% of aroma compounds was lost during concn. of extracts by rotary evaporator. RM

212

The thermal decarboxylation of some substituted cinnamic acids.

Pyysalo, T.; Torkkeli, H.; Honkanen, E.

Lebensmittel-Wissenschaft und -Technologie 10 (3) 145-147 (1977) [26 ref. En] [Tech. Res. Cent. of Finland, Food Res. Lab., SF-02150 Espoo 15, Finland]

The rates of decarboxylation of the frequently-occurring cinnamic acids, p-coumaric (4-hydroxycinnamic), ferulic (4-hydroxy-3-methoxycinnamic), isoferulic (3-hydroxy-4-methoxycinnamic) and caffeic (3,4-dihydroxycinnamic) acids, were studied to evaluate their relative importance in the formation of volatile compounds during heat processing of foods. Other isomers were also studied in order to assess the effect of the position of the substituent groupings on the rate of decarboxylation during incubation in aqueous alcohol at $100-110^{\circ}\text{C}$. The highest rates of decomposition were those of caffeic, p-coumaric and ferulic acids, but the extent of decomposition was normally only slight, except in the presence of strong mineral acids or as a result of enzymic action during the initial heating phase. The results are related to those of other workers concerning odour generation and analytical procedures for cinnamic acid derivatives. Heat-induced formation of vinylphenols from hydroxycinnamic acids under normal food processing conditions is also discussed briefly. BDH

213

The extraction of amines from certain foodstuffs and their identification by mass spectrometry. Crathorne, B.

Dissertation Abstracts International C 37 (1) 100 (1976) [En] [Univ. of Surrey, Guildford, Surrey, UK]

Extraction of amines from samples of chocolate, cheese, wine, cooked meat, baked beans and yoghurt involves homogenization in a 2-phase solvent system and isolation of the amines on an ion-exchange column. The amines are analysed as their trifluoroacetyl derivatives by GLC (on support-coated open tubular columns) and by combined GLC-MS. The major compounds most commonly found in the foods extracted were pyrrolidine, 2-phenylethylamine, isopentylamine, ammonia and 2 compounds which still remain unidentified. The mass spectra of the derivatives of components found in the foods are reported, and the fragmentation processes of the 6 major constituents are discussed. DMK

214

Studies on flavour-active sulphur components of hops and beer.

Pickett, J. A.

Proceedings of the Analytical Division of the Chemical Society 13 (7) 215-217 (1976) [7 ref. En] [Brewing Res. Foundation, Nutfield, Redhill, Surrey RH1 44Y, UK]

A GLC-MS system, using packed columns and simultaneous detection by flame ionization and flame photometry, together with an electron impact system and peak-enhancement studies allowed the identification of S-methyl-thiohexanoate, S-methyl-thio-2-methylbutyrate and S-methyl-thio-4-methylpentanoate in hop oil. Satisfactory hop character was achieved by adding to beer a hop oil obtained by a newly developed process (described by Pickett, Coates & Sharpe, Proceedings of the European Brewery Convention Congress (1975) p. 123: Elsevier, Amsterdam). To distinguish beers and lagers by their S-compounds, relatively highly volatile components were obtained by vacuum stripping, vacuum distillation fractionation between traps at -46° , -116° and -196°C and GLC analysis (allowing detection of < 1 part/billion of S-compounds), and components of lower volatility were obtained by low-temp. steam distillation. Ales were found to contain higher concn. of certain heterocyclic compounds, e.g. 2-acetylthiophene and 2-acetylfuran. The only S-compound contributing to an important degree to lager character was dimethyl sulphide. RM

215

[Aroma components of pear brandy.]

Bricout, J.

Industries Alimentaires et Agricoles 94 (3) 277-281 (1977) [6 ref. Fr, de, en] [Inst. de Recherches Appliquées aux Boissons, 120, Avenue Foch, 94003 Creteil, France]

Aroma components of Williams pear brandy were separated by GLC and identified by IR spectrometry and MS. Tabulated results showed the presence of known by-products of sugar fermentation, unchanged aroma components of fresh pears (especially esters of trans-2-cis-4 decadienoic acid) and products of their partial fermentation (e.g. hexanol). RM

216

[Quantitative composition of natural and technologically modified plant aromas. II. Aroma compounds in oranges and their changes during juice processing.] Über die quantitative Zusammensetzung natürlicher und technologisch veränderter Aromen. II. Orangen-Aromastoffe und deren Veränderungen bei der Safterstellung. Schreier, P.; Drawert, F.; Junker, A.; Mick, W. *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 164 (3) 188-193 (1977) [45 ref. De, en] [Inst. für Lebensmitteltech. & Analytische Chem., TU München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

After enzyme inhibition with methanol the original volatile compounds of the fruit were investigated in order to compare the quantitative composition of the aroma compounds in orange fruits and juices. Aroma compounds of fresh, HTST-treated and pasteurized juice were analysed. After aroma enrichment by liquid-liquid extraction

and prefractionation of the flavour compounds by column chromatography on silica gel, 56 flavour substances in the fruits and in the different juices were identified and determined by gas chromatography and MS. In comparison to their levels in the fruit only 10% of the terpenic hydrocarbons and about 30-66% of the esters were found on average in the juices. Among the secondary flavour substances, which were not present or present only in traces in the fruit, but showed in juices at concn. ≤ 0.2 ppm, were 4-terpinenol, carveol and trans-2,8-methadien-1-ol. After thermal treatment 3-hydroxy-2-butanone and 3-methyl-2-buten-1-ol were also identified. The aroma compounds found and their concn. in oranges and in the juices are tabulated. [See FSTA (1977) 9 3H435 for part I.] AS

217

[Method of manufacturing a wine aroma unaffected by storage.] Verfahren zur Herstellung eines lagerfähigen Weingewürzes.

Schulz, U.

German Federal Republic Patent Application 2 523 585 (1976) [De]

A wine aroma for use in cooking is produced in powder form for extended storage. An absorbent powder, preferably flour, is saturated with wine, preferably freeze-dried and mixed with a moisture-binding substance, preferably NaCl, and various Ca-salts of (citric acid and/or tartaric and orthophosphoric acids). Alternatively, a mixture of wine and mash may be added to the substrate. Partial drying results in a conc. aroma with a viscous consistency. W&Co

218

Aroma quality evaluation of tomatoes, apples, and strawberries.

Dirinck, P.; Schreyen, L.; Schamp, N.

Journal of Agricultural and Food Chemistry 25 (4) 759-763 (1977) [18 ref. En] [Fac. of Agric. Sci., State Univ. of Ghent, Coupure 533, B-9000 Ghent, Belgium]

For aroma quality evaluation of fresh fruits and vegetables the procedure used for isolation of the volatiles from the food matrix is of the highest importance. Representative isolation of tomato, apple and strawberry volatiles was performed by adsorption of the volatiles, liberated while macerating the material, on Tenax. Injection via reconcentration in a cooling trap into gas chromatography-MS gave chromatograms which when compared with other isolation procedures had a simpler composition with higher amounts of organoleptically important compounds. However, a major problem of the described procedure was the contamination of the chromatogram of aroma compounds by organic air pollutants. AS

219

[Recovery of orange essential oil with limonene. Physicochemical characteristics and IR spectra of recovered oils.]

Perez Pastor, R.; Carmona, P.; Lafuente, B.; Bellanato, J.; Hidalgo, A.

Revista de Agroquímica y Tecnología de Alimentos 17 (1) 59-70 (1977) [7 ref. Es, en, de, fr] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

An extraction method is described for recovering the residual orange essential oil normally lost with the pressed scrapings of the peel during cold pressing. It consists of countercurrent extraction with successive solvent impregnation and pressing, using the terpene fraction from industrial deterpenation of the essential oil as solvent. Physicochemical properties and IR spectra of the recovered oils and of 4 chromatographic fractions are shown graphically and in tables, viz. ester index (2.13-0.69 mg KOH/g); aldehydes (0.80-0.27%); carotenoids (158.3-41.6 mg/100 g); density (0.8536-0.8471, 20°/20°); absorbance ratios for aldehydes:limonene acids:limonene and aldehydes:acids (1.456-2.651); chromatographic fractions (n-hexane 91.09-97.31, n-hexane-ethyl acetate 5.11-1.20, ethyl acetate 3.18-0.95, methanol 0.45-0.24%); absorbance ratio citral: α - β -unsaturated linear aldehydes in the n-hexane-ethyl acetate fraction. [See also FSTA (1976) 8 7J1097.] RM

220

[Gas chromatographic determination of some volatile constituents in vinegars manufactured by fermentation.]

Mecca, F.; Vecchio, L. di

Rivista della Società Italiana di Scienza dell'Alimentazione 6 (3) 177-186 (1977) [9 ref. It, en] [Ufficio Controllo Aceti, Milan, Italy]

A GLC method for detn. of volatiles in wine vinegar is described; an 18% Carbowax 400 on Chromosorb W (60-80 mesh) column is used. Data are given for concn. of acetylmethyl carbinol, 2- and 3-methylbutanol, 2-methyl-1-propanol, isoamyl acetate, 1-propanol, 2-butanol, methanol, ethyl acetate, dimethyl ketone, ethanal, ethanol and methylacetate in 17 straw-coloured vinegars, 41 red vinegars and 11 wines for vinegar manufacture. The results show that vinegars contain the same volatiles as the wines from which they are made, except that wines contain little or no 2-butanol or amyl acetate. Red vinegars had higher contents of methanol and 1-propanol than straw-coloured vinegars. Effects of acetic fermentation on the volatiles present are briefly discussed. AJDW

221

The need for growing pepper cultivars to suit pepper products.

Lewis, Y. S.; Krishnamurthy, N.; Nambudiri, E. S.; Amma, B. S. K.; Shivashankar, S.; Mathew, A. G. *Indian Spices* 13 (1) 4-8 (1976) [13 ref. En]

[Cent. Food Tech. Res. Inst., Mysore 570 013, India]

Selection of pepper cultivars is often made on agronomic grounds, with little regard to the quality of the finished spice; with increasing need to meet stringent chemical standards, cultivar selection on a quality basis is necessary. Figures are given for volatile oil % and non-volatile ether extract content of 13 Indian pepper cultivars. Points to be noted in pepper production are discussed, with reference to black and white peppers, bottled green peppers and oleoresin. Black pepper is produced by mild heat treatment to stimulate the enzymes responsible for the coloration; over blanching will inactivate them entirely. Coating the dried pepper with oil is not recommended. White pepper, traditionally made from ripe berries, can also be made from black pepper-corns by de-hulling and from green berries with skins softened by cooking. The former method results in a high % of broken and crushed corns, however. White pepper with an intact skin can also be made by drying well-blanching berries, with further mild bleaching. JRR

222

[Composition of 2 hybrids of *Mentha piperata* Huds developed in the USSR and tested in Piedmont.]

Sacco, T.; Gallino, M.

Essenze Derivati Agrumari 46 (4) 299-309 (1976) [17 ref. It] [Istituto di Botanica Speciale Vet. dell' Univ. di Torino, Torino, Italy]

2 Russian hybrids of *M. piperata* were grown and studied at the Turin Botanical Institute. The composition of their essential oils (shown in a table and gas chromatograms) was qualitatively similar but differed in the % of menthone, menthol and menthyl acetate, which accounted for 7.74, 52.76 and 15.41% in *M. Poliibrida* 7 and 25.35, 28.09 and 9.53% in *M. Prilukskaja* 6 respectively. RM

223

[Essential oil from *Piper nigrum* L.]

Debrauwere, J.

Dissertation Abstracts International C 37 (1) 148 (1975) [NI] [RijksUniv., Ghent, Belgium]

The essential oil was extracted from crushed berries with methylene chloride. The oil consists of a terpenoid hydrocarbon fraction (88.9%) which may be separated from an oxygenated fraction. The hydrocarbon fraction was further separated into monoterpenic and sesquiterpenic fractions, and each fraction studied by preparative gas chromatography and gas chromatography-MS. 3 sesquiterpenes were identified which were previously unreported as constituents of the oil. The oxygenated fraction was (i) divided into 25 subfractions by preparative gas chromatography. Each subfraction was analysed by gas chromatography-MS and, where possible, compounds isolated (by preparative gas chromatography using wide bore glass capillaries with a microthermal conductivity detector) for spectroscopic analysis. The oxygenated fraction was also separated into free acids, esters, carbonyl

mpounds, alcohols and oxides and these fractions
re analysed by gas chromatography-MS. 23 new
mpounds were identified, making a total of 56
mpounds identified in the oxygenated fraction of
ack pepper oil. An aroma panel judged 2
ctions (from the (i) separation) to be
aracteristic of pepper aroma. Further
romatographic analysis showed 3 constituents to
responsible for the aroma, and these had mol.
of 202, 220 and 222. The MS data obtained did
t permit unambiguous identification of these 3
mpounds. DIH

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AB 4

TECHNIQUES FOR ANALYSIS OF FLAVOUR VOLATILES

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H. BROOKES

ASSISTANT EDITOR

1

[Interactions between aroma substances and lipids. I. Sorption of some volatile substances in pure lipids.] Wechselwirkungen zwischen Aromastoffen und Lipiden. I. Sorption einiger leichtflüssiger Stoffe an reine Lipide.

Maier, H. G.; Kessler, K.

Fette, Seifen, Anstrichmittel 79 (6) 241-244

(1977) [19 ref. De, en] [Inst. für Lebensmittelchem. der Tech. Univ. Braunschweig, Fasanenstrasse 3, 3300 Braunschweig, Federal Republic of Germany]

Ethyl acetate, n-hexane, ethanol and acetone were sorbed better by liquid fats than by solid fats. The sorption capacity of liquid fats increased with decreasing chain length of the fatty acid residues, in the order of triglycerides, free fatty acids, fatty acid methyl esters. Oleic acid derivatives sorbed more than stearic acid ones. The amounts sorbed decreased in the order ethyl acetate > ethanol or hexane > acetone, both for small amounts measured by GLC retention vol. and larger amounts measured by gravimetry. Strong binding was observed between phenol and esters and between n-butylamine or pyridine and free acids. The calculated sorption of ethyl acetate, ethanol, hexane and acetone on cocoa butter or model cocoa butter (38% triolein, 36% tristearin, 26% tripalmitin) deviated from experimentally determined values by +41 to -41%. RM

2

Chromatography of natural phenolic cinnamate derivatives on Sephadex LH-20 and G-25.

Singleton, V. L.; Timberlake, C. F.; Whiting, G. C.

Journal of Chromatography 140 (1) 120-124

(1977) [5 ref. En] [Univ. of Bristol, Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

A repurified commercial sample of 5-chlorogenic acid and a sample of 4-p-coumaroylquinic acid isolated from apples were used as the test samples in a study on application of chromatography on Sephadex LH-20 and G-25 to separation of natural phenolic cinnamate derivatives. Difficulties were encountered with peak shape, purity and variability. Chlorogenic acid-type substances were generally well separated, and free from typical UV absorption spectra of cinnamates. Cinnamate derivatives gave individual chromatographic peaks; however, when rechromatographed, peak fractions expected to be pure were contaminated by cinnamates concentrated in other peaks, depending on conditions. This behaviour was found to be due to cis-trans isomerism in these compounds, indicating the potential value of chromatography on Sephadex LH 20 & G25 in studying cis/trans isomerization of these compounds. SP

3

[Determination of volatile phenols in products of animal and vegetable origin.]

Polishchuk, L. P.; Matvienko, I. N.; Ziserman, I. Z. *Gigiena i Sanitariya* No. 7, 72-74 (1977) [2 ref.

Ru] [Kievskii Nauchno-issled. Inst. Gigeny Pitaniya, Kiev, USSR]

A method is described for detn. of simple phenols in foods of animal and vegetable origin (including fish). The method involves extraction (by steam distillation from an acid medium) of the phenols, colorimetric detn. with pyramidone and TLC identification. The sensitivity of the method (mg/kg) is: colorimetric detn. 0.2; and chromatographic 0.04-0.06 for phenol, o- and m-cresol, and 0.2-0.3 for p-cresol. HBr

4

Apparatus and procedure for reproducible, high-resolution gas chromatographic analysis of alcoholic beverage headspace volatiles.

Williams, P. J.; Strauss, C. R.

Journal of the Institute of Brewing 83 (4) 213-219

(1977) [23 ref. En] [Australian Wine Res. Inst., Glen Osmond, S. Australia 5064, Australia]

A readily established method is reported for concentrating headspace volatiles on a bed of the porous polymer, Chromosorb 105. The trapped components are transferred by a desorption technique onto a small plug of 10% silicone oil SF96 coated support material. The volatiles can then be injected onto a high-resolution gas chromatographic column by a simple process. The apparatus required and the steps involved in the procedure are discussed in detail. The precision of the method for the quantitative detn. of alcoholic beverage headspace volatiles was assessed for a range of typical compounds from a flor sherry; the relative SD are in the range 2-10%. Examples are given of applications of the technique to the analysis of alcoholic spirits and beverages. AS

5

[Gas chromatographic characterization of whisky.

II. Scotch whisky.] Gaschromatographische Charakterisierung von Whisky. II. Schottischer Whisky.

Postel, W.; Adam, L.

Branntweinwirtschaft 117 (12) 229-234 (1977)

[30 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Studies were conducted by GLC on volatile aroma compounds present in a total of 61 samples of Scotch whisky (6 malt whiskies, 1 grain whisky and 54 blended whiskies). Tables of results are given. 10 carbonyl compounds, 12 alcohols and 23 esters were identified. Malt whiskies had markedly higher aroma compound contents than grain whisky. Conc. of 1-propanol, isobutanol, methanol and ethyl acetate in these 2 types of whisky were approx. equal. The total concn. of other aroma volatiles was approx. 300 mg/100 ml alcohol in malt whisky, vs. 30 mg/100 ml alcohol in grain whisky. Ester content (excluding ethyl acetate) was approx. 32 mg/100 ml alcohol in malt whiskies, vs. 4 mg/100 ml alcohol in grain whisky. 3 classes of blended whisky could be differentiated: normal

blends, containing >30% (commonly 30-45%) malt whisky; cheap blends, with lower malt whisky contents; and so-called 'blended' whiskies in which little or no malt whisky was detectable. The situation of this last group in relation to German legislation for foods and beverages is considered. Criteria for evaluation of whiskies are discussed, including the isoamyl alcohol:isobutanol ratio, the isoamyl alcohol:1-propanol ratio and the sum of the contents of ethyl esters of caprylic, capric and lauric acids. [See FSTA (1977) 9 2H234 for part I.]
AJDW

6

[Quantitative analysis of important components and aroma compounds of apple juices produced by a combined pressing-extraction process in pilot-scale experiments.] Quantitative Untersuchung wichtiger Inhalts- und Aromastoffe von Apfelsäften aus dem kombinierten Press-Extraktionsverfahren anhand von Modellversuchen.

Schobinger, U.; Dürr, P.

Flüssiges Obst 44 (7) 275-278, 283 (1977) [4 ref. De, en, fr] [Eidgenössische Forschungsanstalt für Obst-, Wein- & Gartenbau, CH-8820 Wädenswil, Switzerland]

The extraction of the main soluble components of apples by a combined pressing-extraction process was studied in pilot-scale experiments. After pressing in a hydraulic packing press, the press-cakes were extracted 4 times with cold or hot (57°C) water. Warm water accelerated the extraction of soluble components (sugar, acid, polyphenols, aroma components) and increased the overall juice yield (94-97%, vs. 91-96%), but produced higher extraction of coloured compounds and polyphenols and lower extraction of aroma components, resulting in lower sensory quality than cold water extraction. Juices from cold or warm water extraction of pressed apple residues had higher concn. of sugar-free extract and aroma components, and lower titratable acidity than the corresponding press juices. AS

7

[Enzymic breakdown of linoleic acid hydroperoxides to volatile carbonyl compounds by isomerase from barley.] Enzymatischer Abbau von Linolsäurehydroperoxiden zu flüchtigen Carbonylverbindungen durch Isomerase aus Gerste.

Heimann, W.; Timm, U.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 165 (1) 7-11 (1977) [29 ref. De, en] [Inst. für Lebensmittelchemie der Univ. Karlsruhe, Kaiserstrasse 12, D-7500 Karlsruhe 1, Federal Republic of Germany]

Barley protein fractions with active hydroperoxide isomerase, purified by means of gel chromatography, were incubated at room temp. with linoleic acid hydroperoxides (LHPO), containing 9-hydroperoxy-10-trans,12-cis-octadecadienoic acid (9-LHPO) and 13-hydroperoxy-9-cis,11-trans-octadecadienoic acid

(13-LHPO) in the ratio of about 1:1. The volatile compounds resulting from the reaction were isolated, concentrated and investigated by means of gas and radio-gas chromatography. In the case of incomplete LHPO-breakdown remaining hydroperoxides and nonvolatile breakdown products were separated before gas chromatographic analysis. In addition to hexanal as main product, traces of 2-trans-heptenal and 2-trans-octenal were found; about 6% of the converted hydroperoxides were transformed to carbonyl compounds. By numerous additional experiments it was confirmed that the volatile compounds are formed by enzymic catalysis. [See also preceding and following abstr.] AS

8

[Volatile carbonyl compounds from the reaction of barley isomerase with linoleic acid hydroperoxides. Their development from the 9- or the 13-hydroperoxide isomer.] Flüchtige Carbonylverbindungen aus der Reaktion von Gerstenisomerase mit Linolsäurehydroperoxiden. Ihre Entstehung aus den 9- oder 13-Hydroperoxid-Isomeren.

Heimann, W.; Timm, U.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 165 (1) 12-14 (1977) [19 ref. De, en] [Inst. für Lebensmittelchemie der Univ. Karlsruhe, Kaiserstrasse 12, D-7500 Karlsruhe 1, Federal Republic of Germany]

Hydroperoxide isomerase from barley was incubated with linoleic acid hydroperoxides (LHPO), containing almost exclusively the 13-hydroperoxy-9-cis,11-trans-octadeca-dienoic acid (13-LHPO) or the 9-hydroperoxy-10-trans,12-cis-octadecadienoic acid (9-LHPO) isomer; the volatile reaction products were isolated, concentrated and investigated by means of gas and radio-gas chromatography. Thus it was possible to establish the precursors of the volatile compounds hexanal, 2-trans-heptenal and 2-trans-octenal, which develop during reactions of isomerase with substrates containing 9- and 13-LHPO in equal amounts [see preceding abstr.]. 13-LHPO was found to be a precursor of hexanal and 2-trans-octenal, while the 9-LHPO isomer in the barley isomerase LHPO breakdown reaction cannot be accepted as a precursor of volatile components. The origin of 2-trans-heptenal could not be clarified; it occurred neither in the experiments with predominating 9-LHPO nor in those with predominating 13-LHPO. Perhaps 2-trans-heptenal is only produced in the presence of a defined ratio of both isomeric hydroperoxides. AS

9

[Quantitative composition of natural and technologically modified plant aromas. IV. Enzymic and thermal reaction products formed during processing of tomatoes.] Über die quantitative Zusammensetzung natürlicher und technologisch veränderter pflanzlicher Aromen. IV. Enzymatische und thermische Reaktionsprodukte bei der

Verarbeitung von Tomaten.

Schreier, P.; Drawert, F.; Junker, A.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 165 (1) 23-27 (1977) [54 ref. De, en]
[Inst. für Lebensmitteltech. & Analytische Chemie
der TU München, D-8050 Freising-
Weißenstephan, Federal Republic of Germany]

After the qualitative and quantitative investigation of the flavour compounds of tomatoes, the flavour compositions of tomato juices treated by different technological methods were determined. 80 aroma components were identified in tomato juice by gas chromatography-MS. The quantitative comparisons showed that during the processing of juices unsaturated fatty acids acted as precursors for a series of C₆-compounds, especially 1-hexanol and cis-3-hexen-1-ol, and that on the other hand some aroma compounds derived from carotenoid like structures, e.g. 6-methyl-5-hepten-2-one, geranyl- and farnesylacetone and β -ionone were formed. Increases were observed in the amounts of reaction products of thermal treatments such as acetoin, furfural, 5-methylfurfural and 6-methyl-5-hepten-2-one. The distribution of the aroma compounds dissolved in the serum or bound on the pulp was determined quantitatively by employing gas chromatographic methods. [See FSTA (1977) 9 12H1991 for part II.] AS

10

Cephalosporium albidus, a new heterothallic yeast-like fungus.

Kurtzman, C. P.

Mycologia 69 (3) 547-555 (1977) [14 ref. En]
[N. Regional Res. Cent., ARS, USDA, Peoria
Illinois 61604, USA]

The new species *C. albidus* was isolated from cranberry pomace, where it caused an odour of isobutyl acetate. RM

11

[Composition of essential oils. XIV. Essential oils of grapefruit, mandarin and lemons from Ethiopian East Africa.]

Rovesti, P.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 59 (6) 273-276 (1977) [3 ref. It] [Istituto di Ricerche su Derivati Vegetali, Milan, Italy]

The compositions of essential oils obtained from grapefruit, mandarins and lemons from Eritrea and Somalia were comparable to those from Sicily, with the same physico-chemical characteristics. [See FSTA (1977) 9 6J795 for preceding part.] RM

12

A note on the determination of moisture and volatile matter of palm oil. (In 'Progress towards better palm oil test methods' [see FSTA (1978) 10 1N11].) [Lecture]

Chin, A. H. G.

pp. 4-12 (1977) [En] [MARDI, Serdang, Malaysia]

A tentative method, based on the VOTC method with a few amendments, is proposed for further inter-laboratory cross checks. It includes the following key points: container, a 6-cm Petri dish with or without cover; sample size, 10 ± 1 g; oven temp., $103 \pm 2^\circ\text{C}$; position in oven, middle shelf; and time of drying, 21 h once only. The use of a vacuum oven was not practical; cooling time of 1 h in a desiccator after drying, good homogenization of samples and expression of the moisture content to 2 decimal places were recommended. RM

13

Building stones of flavours.

Seidman, M.

International Flavours and Food Additives 8 (4) 157-161 (1977) [8 ref. En]

A description is given of some compounds responsible for the flavour of foods; reactions between flavour precursors are discussed with the aid of equations, with reference to conditions under which flavour compounds are formed. AJDW

14

WCOT glass capillary columns in flavour chemistry.

Jennings, W. G.; Wyllie, S. G.; Alves, A.

Chromatographia 10 (8) 426-429 (1977) [4 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

By incorporating an HNU photoionization detector and a Carle microvolume valve into a standard dual column chromatograph, individual peaks eluting from a 0.20-0.25 mm internal diam. glass capillary column can be subjected to aroma evaluation, collected or valved to a second glass capillary column to check homogeneity and/or establish the retention index on a second liquid phase. The system is illustrated by diagrams showing a glass inlet splitter incorporating flow inversion characteristics, schematic flow diagrams and chromatographs of a low-flavoured Bartlett pear essence and a peppermint oil. RM

15

[Study on the composition of aromatic alcohols.]
Podlubnaya, E. T.; Stepnaya, V. E.; Bachurin, P. Ya.; Slavutskaya, N. I.

Fermentnaya i Spirtovaya Promyshlennost' No. 3, 30-33 (1977) [3 ref. Ru] [VNIIPB, USSR]

UV spectra of pure aromatic substances and fractions of distillates of extracts of orange, lemon and curacao peel were compared. The absorption spectra were similar in the case of all 1st distillation fractions investigated. Spectra of d-limonene, d-linalool- α -pinene, lauric aldehyde, decylaldehyde, citronellol and nonylol were identified. Spectra of fractions with an ethanol content of $<80\%$ (w.t.) were the same as the citral spectrum, and confirmed the absence of d-limonene (with the exception of curacao peel distillate, which had no citral spectrum). STI

16

The constituents of the essential oil from Japanese quince fruit, *Cydonia oblonga* Miller.

Shimizu, S.; Yoshihara, S.

Agricultural and Biological Chemistry 41 (8) 1525-1527 (1977) [14 ref. En] [Dep. of Agric. Chem., Shinshu Univ., Ina, Nagano-ken 396, Japan]

1.52 g essential oil was obtained from 20 kg Japanese quince fruits by steam distillation, saturation of the distillate with NaCl and ether extraction. Analysis of the oil by capillary gas chromatography revealed 12 peaks. The identity of the major peak (>50%) was established as trans- α -farnesene by silica gel chromatography of the oil followed by MS and UV and NMR spectroscopy. A combination gas chromatography-MS technique was used to study the other oil constituents. 4 ethyl esters, of C6, C8, C10 and C12 saturated acids, were identified, and 4 ethyl esters of unsaturated acids were assigned to peaks not positively identified. The ethyl esters of unsaturated acids made up approx. 10% of the essential oil, and together with the esters of saturated acids, were thought to be responsible for the aroma. Trans- α -farnesene did not contribute to the fruit aroma. DIH

17

Volatile components of figs.

Jennings, W. G.

Food Chemistry 2 (3) 185-191 (1977) [4 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

Volatile essences of Calimyrna, Kadota, Black Mission and Adriatic figs were prepared by passing large vol. of headspace gas through porous polymer traps at room temp. The essences were analysed by GLC using wall-coated open-tubular glass capillary columns; structural elucidations were based on GLC-MS. Differences between var. appeared to be quantitative rather than qualitative and were not noticeably greater than differences between samples of the same var. Compounds identified included: acetaldehyde; dimethyl acetal; methyl, ethyl, propyl, isobutyl and 2-methylbutyl acetate; ethyl alcohol; ethyl propionate, isobutyrate and butyrate; 2-methyl butyrate and valerate; methyl, ethyl and ethyl-2-methyl butyrate; 2-ethyl-1,2-dihydrothiophene; and 3-hydroxy-2-butanone. Many of these compounds are typical of yeast fermentations. Their variability is attributed to fermentations in the ripening fruits. RM

18

[Effect of variety and fertilization on the spectrum of volatile aroma compounds in potatoes.] Einfluss von Sorte und Düngung auf das Spektrum flüchtiger Aromastoffe in Kartoffeln.

Khan, I.; Müller, K.; Warmbier, H.

Potato Research 20 (3) 235-242 (1977) [7 ref. De] [Inst. für Agrikulturchemie der Univ., Von-Siebold-Strasse 6, 3400 Göttingen, Federal Republic of Germany]

The following flavour compounds were

determined by GLC in potatoes var. Grata and Saturna: acetaldehyde, propanal, 2-butanone, pentanal, heptanone, heptanal, 2-hexenal, octanal and nonanone. The composition of volatiles in the 2 var. was roughly similar, but the quantitative distribution differed. Varying the NPK and Mg fertilization rates produced appreciable shifts in the distribution of the flavour volatiles, with resulting effects on the culinary quality and industrial application of the potatoes. RM

19

Characterisation of green aroma of raw mango (*Mangifera indica* L.).

Gholap, A. S.; Bandyopadhyay, C.

Journal of the Science of Food and Agriculture 28 (10) 885-888 (1977) [7 ref. En] [Biochem. & Food Tech. Div., Bhabha Atomic Res. Cent., Trombay, Bombay 400 085, India]

The latex of 2 var. of mango, Alphonso and Batali, was collected during the de-stalking of freshly picked matured unripe (raw) fruit. The essential oil of each of the mango latices was isolated by high vacuum distillation at ambient temp. The major component of each essential oil possessing the characteristic aroma of green mango was isolated by preparative GLC and was characterized by UV, IR, NMR and MS as cis-ocimene and β -myrcene, resp. AS

20

Conversion of aldehydes to alcohols in liquid foods by alcohol dehydrogenase. [Lecture]

Eriksson, C.; Qvist, I.; Vallentin, K.

ACS Symposium Series 47, 132-142 (1977) [13 ref. En] [SIK, Swedish Food Inst., Fack, S-40021 Göteborg, Sweden]

Enzymic interconversion of aliphatic aldehydes, alcohols and carboxylic esters is briefly surveyed. Odour properties (quantitative and qualitative) of some aldehydes and alcohols which are normally found in foods after lipid oxidation were studied. Experiments were carried out to reduce the amount of preformed aldehydes, particularly n-hexanal in milk containing polyunsaturated fat, by addition of alcohol dehydrogenase and NADH. Results showed that both discontinuous and continuous treatment of skim-milk or whole milk reduced the concn. of the initially formed n-hexanal instantaneously, or kept it reduced throughout the experiment. [See FSTA (1978) 10 2G59.] AL

21

[GLC determination of some volatile constituents of wine spirits. I.]

Mecca, F.; Vecchio, L. di

Bollettino dei Chimici dei Laboratori Provinciali 3 (5) 140-154 (1977) [5 ref. It, de, en, fr] [Ufficio Controllo Aceti di Milano, Milan, Italy]

A GLC-based method is proposed for detn. of the main volatile constituents of wine spirits and brandies. It can be used to characterize the composition as normal or anomalous and to identify the origin and age of the spirits. Results from 15

samples are tabulated. The changes and concn. of acetaldehyde, dimethylketone, methanol, higher alcohols and esters in genuine brandies are discussed. [See following abstr. for part II.] RM

22

[GLC determination of some volatile components of the spirits from grape marc, fruits, grains, sugar cane and liqueurs. II.]

Mecca, F.; Vecchio, L. di

Bollettino dei Chimici dei Laboratori Provinciali 3 (7) 204-216 (1977) [6 ref. It, de, en, fr] [Ufficio Controllo Aceti di Milano, Milan, Italy]

The distinction and control of various distillates through GLC analysis of the volatiles is illustrated with tabulated data for grappa, gin, whisky, rum, fruit brandies (pear, plum, apple, cherry), gentian brandy, liqueurs and 95% ethanol. [See preceding abstr. for part I.] RM

23

Effects of abscission agents on composition and flavor of cold-pressed orange peel oil.

Moshonas, M. G.; Shaw, P. E.

Journal of Agricultural and Food Chemistry 25 (5) 1151-1153 (1977) [10 ref. En] [Citrus & Subtropical Products Lab., S. Region, USDA, Winter Haven, Florida, USA]

Essential peel oils from Hamlin, Pineapple, and Valencia oranges treated with abscission agents were evaluated for flavour changes by comparison with oils from the untreated oranges. Fruit which had met min. maturity standards (barely-mature) and well-mature oranges were studied. Each peel oil was added to a sample of high-quality 'evaporator pumpout' (65° Brix concentrate, diluted to 12° Brix for tasting) containing no other flavouring fraction and was evaluated by a trained taste panel. Usually, the panel detected differences between oils from treated and control fruit and generally preferred the control oils. 17 predominant volatile constituents of the oils were isolated and identified. In the barely-mature fruit, quantitative differences in oil composition were observed and indicated an acceleration of maturity processes by the abscission agents; but in the well-mature fruit oil no marked differences were found. Oils from treated and control oranges did not differ qualitatively in composition. AS

24

Studies on the volatile components of rice and rice bran. I. Fractionation and identification of volatile acids and phenols in the steam distillate of rice bran.

Fujimaki, M.; Tsugita, T.; Kurata, T.

Agricultural and Biological Chemistry 41 (9) 1721-1725 (1977) [19 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Tokyo, Japan]

Fractionation of the volatile concentrate obtained from steam-distillate of rice bran and organoleptic tests of each fraction were carried out.

The neutral fraction was present in greater amount than others and was assumed to be indispensable for the reproduction of rice bran odour. The acidic fraction methylated with diazomethane and the phenolic fraction were analysed by glass capillary gas chromatography to identify 17 carboxylic acids and 7 phenols. 4-vinylguaiacol and 4-vinylphenol identified in the steam volatile concentrate were considered to be produced from ferulic and p-coumaric acids during steam-distillation. 4-vinylphenol was the main component in the steam volatile concentrate of rice bran, having a characteristic unpleasant odour. AS

25

[Determination of free volatile fatty acids in cheese by chromatography on 'Silufol'.]

Chmel, K.; Minarik, R.

Prumysl Potravin 28 (8) 460-461 (1977) [Cs]

[Sklarny Kavalier, Votice, Czechoslovakia]

A method, intended primarily for qualitative detn. of free volatile fatty acids in cheese, using chromatography on Silufol film is outlined. It is based on the principle of isolating these acids from the product by distillation with water vapour from an acid medium and their transformation into sodium salts, which are then transformed into free acids; these are extracted with diethyl ether and dried with Na₂SO₄. Methyl red is used for the detection of the spots. A diagram shows the detection of C1-C5 acids. FL

26

[Composition of the essential oil of *Mentha piperita* L. cultivated in vitro: influence of various factors on its synthesis.]

Bricout, M. J.; Paupardin, C.

Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, D 281 (5/6/7/8) 383-386

(1975) [9 ref. Fr] [Inst. de Recherches Appliquees aux Boissons, 120 Avenue Foch, 94003. Creteil, France]

Tissues (cuttings) of *Mentha piperita* were cultivated in a liquid medium containing mineral salts, varying concn. of glucose and in some cases benzyladenine. The essential oil synthesized in vitro differed considerably from that produced by the original plant. The in vitro tissues contained large quantities of pulegone and menthofuran (both absent from the original plant), attributed to formation from glucose, but very little menthone compared with the original. Pulegone is believed to be the key compound from which menthone and menthol are synthesized, but with in vitro cultivation the menthone pathway is inhibited in favour of menthofuran. ELC

27

[The essential oil content of ground spices.] Der Gehalt an aetherischem Öl bei gemahlenen Gewürzen.

Strauss, D.

Deutsche Lebensmittel-Rundschau 73 (10) 332-334 (1977) [11 ref. De] [Landesanstalt für Lebensmittel-, Arzneimittel- & Gerichtliche Chem., Berlin (West)]

Data are given for the contents of essential oils, total ash and HCl-insoluble ash in samples of commercial ground spices (cardamom, caraway seed, cumin, aniseed, coriander, cloves, ginger, black pepper, white pepper, cinnamon, allspice). The experimental data are compared with DIN requirements and literature data. Min. values for the essential oil contents of ground spices are recommended as follows (ml/100 g): cardamom (seeds only), 1.8; cardamom (seeds + husk), 1.0; caraway, 1.5; cumin, 1.0; aniseed, 1.8; coriander, 0.4; allspice, 1.5; white pepper, 0.8; black pepper, 1.0; cloves, 15.0; and cinnamon, 0.8. AJDW

28

Tea aromatization.

Societe Produits Nestle SA

British Patent 1 485 512 (1977) [En]

The taste and aroma of instant tea products is improved by the incorporation of anthranilate aromatizers. IFT

29

[A study on the volatile flavor components in Kimchis.]

Yoon, J.-S.; Rhee, H.-S.

Korean Journal of Food Science and Technology 9 (2) 116-122 (1977) [21 ref. Ko, en] [Dep. of Food & Nutr., Coll. of Home Economics, Seoul Nat. Univ., Seoul, Korea]

The volatile flavour components of Kimchi were identified; volatiles of fermented Kimchis (1.29% NaCl and 4.89% NaCl) were compared with those of raw Kimchi (1.29% NaCl). The volatile flavour components were identified by GLC. 17 volatile flavour components of Kimchis were identified by their retention times, acetaldehyde, acetone, ethanol, ethyl sulphide were positively identified by m.p., IR, UV, TLC, etc. Ethanol was the most abundant volatile of Kimchi, its content was much higher in fermented low salt Kimchi than in unfermented low salt Kimchi. Acetaldehyde and volatile S compounds were reduced in fermented Kimchis, especially in fermented low salt Kimchi. A table of volatiles identified and their relative abundance is given. AS

30

Volatile odorous compounds responsible for metallic, fishy taint formed in butterfat by selective oxidation.

Swoboda, P. A. T.; Peers, K. E.

Journal of the Science of Food and Agriculture 28 (11) 1010-1018 (1977) [18 ref. En] [Chem. Div., ARC Food Res. Inst., Colney Lane, Norwich NR4 7UA, UK]

The volatile compounds produced during the selective oxidation of butterfat at 35°C induced by

α -tocopherol and cupric palmitate were isolated and their characteristic odour described as 'metallic' and 'fishy'. These odorous volatiles were shown to be carbonyl compounds. On chromatographic separation, the 'metallic' odour was found to be associated with certain vinyl ketones, and the unpleasant 'fishy' character with the class of compounds containing a 2,4-dienal structure. The relative yields of the various volatile compounds indicated a selective mechanism for their production. [See also following abstr.] AS

31

Metallic odour caused by vinyl ketones formed in the oxidation of butterfat. The identification of octa-1,cis-5-dien-3-one.

Swoboda, P. A. T.; Peers, K. E.

Journal of the Science of Food and Agriculture 28 (11) 1019-1024 (1977) [16 ref. En] [Chem. Div., ARC Food Res. Inst., Colney Lane, Norwich NR4 7UA, UK]

Oct-1-en-3-one and the more potent octa-1,cis-5-dien-3-one have been identified as being responsible for the metallic odour which developed when a model system containing butterfat, α -tocopherol and cupric palmitate was allowed to oxidize at 35°C for 35 h. These vinyl ketones were synthesized, their mass and NMR spectra determined, and odour descriptions and odour thresholds assessed. Octa-1,cis-5-dien-3-one in aqueous solution could be detected at a dilution of 1 in 10^{12} . Its metallic odour was also described as like geranium leaves. Oct-1-en-3-one (detectable at 1 in 10^{10} dilution) was described as mushroom like at low concn. and only exhibited a metallic odour at higher concn. Both compounds had an odour threshold concn. about $500 \times$ greater in groundnut oil than in water. The significance of these compounds is discussed with reference to the published literature and their formation from (n-3) and (n-6) polyenoic fatty acids. [See also preceding abstr.] AS

32

Analysis of gas chromatographic profiles of 'Katsuobushi' (dried bonito) flavor by pattern similarity analysis method.

Aishima, T.; Nobuhara, A.

Agricultural and Biological Chemistry 41 (10) 1841-1846 (1977) [20 ref. En] [Central Res. Lab. of Kikkoman Shoyu Co. Ltd., Noda-shi, Chiba-ken, Japan]

Katsuobushi (dried bonito) flavour was prepared by vacuum ethanolic distillation without losing its original organoleptic characteristics. GLC profiles of the prepared Katsuobushi flavour were analysed by calculating the pattern similarity coeff. and radian distances. The GLC profile of the phenolic fraction was the most similar to that of the whole flavour among the separated 4 fractions. The GLC profiles of Katsuobushi and Niboshi (dried sardine) mixtures blended at different ratios were compared, and the pattern similarity coeff. were found to be

hanged in proportion to the mixed ratios. These results show a good agreement with organoleptic valuation and suggested that Katsuobushi flavour was ascribed to an integrated effect of many aroma compounds. AS

33

Identification of alkyl-5H-6,7-dihydrocyclopenta[b]pyrazines in roasted meat flavour. Model reaction used as a basis for natural product formation and synthesis.]

Flament, I.; Kohler, M.; Aschiero, R.

Helvetica Chimica Acta 59 (7) 2308-2313 (1976)

[18 ref. Fr, en] [Firmenich SA, Div. de Recherches, CH 1211 Geneva 8, Switzerland]

Seven alkyl-5H-6,7-

dihydrocyclopenta[b]pyrazines were identified in a roasted meat aroma obtained by thermolysis of the water soluble flavour precursors in raw meat (mainly amino acids and sugars). Formation of these heterocyclics by condensation of hydroxycyclopentenones with aliphatic α -dicarbonyl compounds in the presence of ammonia was confirmed by a model reaction. Alkyl-5H-cyclopenta[b]pyrazines and dicyclopenta[b,e]pyrazines were also obtained from this reaction, but have not yet been identified in roasted flavours. Preparation of the intermediates of the model reaction enabled development of an economical synthesis of 2,3,5-trimethyl-5H-6,7-dihydrocyclopenta[b]pyrazine. AS

34

Effects of pH on the flavor volatiles of poultry meat during cooking.

Rao, C. S.; Day, E. J.; Chen, T. C.

Poultry Science 56 (3) 1034-1035 (1977) [7 ref.

En] [MAFES, Poultry Sci. Dep., Mississippi State Univ., Mississippi 39762, USA]

The breast and thigh meats of broiler carcasses were hand deboned, blended and cooked at natural pH and at pH values of 2.4, 4.0, 7.0, 9.0 and 10.0. The S-containing volatiles and the carbonyl volatiles produced upon cooking were collected as their Pb derivatives and their 2,4-dinitrophenylhydrazones accordingly. Cooking broiler meat at neutral pH was the least effective in the production of S-containing volatiles as compared to other tested samples. However, cooking at neutral pH yielded the greatest amounts of carbonyls. Increasing pH values of poultry meat beyond 7.0 before cooking increased the yield of S-containing volatiles greatly and decreased the carbonyls. This effect was less pronounced in the acid region than in the alkaline region. AS

35

[Study of the phase composition of an essential coriander oil/fatty coriander oil/liquid CO₂ system.]

Shtovkhan', N. P.; Koshevoi, E. P.; Maslikov, V. A.; Kurnosov, A. G.; Troitskaya, N. S.

Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 3, 123-124 (1977)

[7 ref. Ru] [Krasnodarskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, Krasnodar, USSR]

Experimental data on the phase composition of the 3 named components are given; these are necessary for the analysis of the solvent extraction of the volatile oil from a mixture. The phase conditions were determined at 278, 283, 288, 293, 298 and 303° K in special laboratory equipment. Increased temp. was shown to improve the solvent separation of the components. The separating ability also improved at higher CO₂ levels. STI

36

Studies on the essential oils of the Pakistan species of the family Umbelliferae. I. *Trachyspermum ammi* (L.) Sprague (Ajowan) seed oil.

Ashraf, M.; Bhatti, M. K.

Pakistan Journal of Scientific and Industrial Research 18 (5) 232-235 (1975) [17 ref. En]

[PCSIR Lab., Lahore, Pakistan]

The essential oil of fresh and 1-yr-old large and small seeds of *T. ammi* (ajowan, *Carum copticum*) grown in Pakistan was characterized. Oil yields were 2.5-3.5% for old large seeds, 3.2-3.5% for fresh large seeds, 5.0-5.2% for fresh small seeds. Better and faster oil recoveries were obtained if the plant material was first distilled with steam, and water added at the final stages of the distillation. The chemical composition by GLC was (values for fresh large and small seeds) resp.: 0.33 and 0.63%, α -pinene; 0.63 and 0.56%, camphene; 1.24 and 1.56%, β -pinene; 0.42 and 0.80%, Δ^3 -carene; 0.25 and 2.25%, limonene; 20.35 and 18.70%, γ -terpinene; 23.78 and 20.80%, p-cymene; and 53.00 and 54.70% total phenols (of which 45.20 and 48.50% was thymol, 6.80 and 4.50% carvacrol). Both yield and composition varied with the location of cultivation and storage of the seeds. RM

37

Studies on the essential oils of the Pakistan species of the family Umbelliferae. II. *Foeniculum vulgare* Miller (fennel) seed oil.

Ashraf, M.; Bhatti, M. K.

Pakistan Journal of Scientific and Industrial Research 18 (5) 236-240 (1975) [15 ref. En]

[PCSIR Lab., Lahore, Pakistan]

The essential oil of *F. vulgare* (fennel) seed oil grown in Pakistan was characterized. The physicochemical characteristics and chemical composition were comparable with those of the oils produced in other countries (France, USSR, Portugal, India). The chemical composition by GLC was: α -pinene, 3.0%; camphene, 0.65%; α -phellandrene, 0.44%; limonene, 4.56%; fenchone, 10.20%; methyl chavicol, 3.50%; anethole, 74.85%; anisaldehyde, 1.80%; p-anisic acid, 1.00%.

Distillation gave better and faster recoveries if crushed plant material was first distilled with steam, and water added at the final stages. No significant differences in composition were observed between fresh and old seeds. Essential oil from flowering fennel had no commercial value because of its low yield, low % of anethole (approx. 25%) and high % hydrocarbons (approx 60%). [See preceding abstr.] RM

38

Effect of fermentation and aging on some flavouring components in tropical fruit wines.

Alian, A.; Musenge, H. M.

Zambia Journal of Science and Technology 2 (1) 10-17 (1977) [15 ref. En] [Food Tech. Res. Unit, Nat. Council for Sci. Res., PO Box CH.158, Chelston, Lusaka, Zambia]

The flavouring components in masuku wine were compared with those in pineapple, guava and mulberry wines and commercial sauternes by chemical and GLC analyses. Some alcohols, fixed and volatile acidity, esters and aldehydes were determined during normal yeast fermentation and subsequent aging. Tabulated results showed that the chemical composition of the wines fell within the normal limits, while fermentation and ageing improved the flavour of the wines studied. Alcohol content in masuku wine reached 11.11% after 10 days. The balance of volatile acidity, esters and aldehydes coupled with zero bacterial count showed that fermentations were completed without bacterial spoilage. The wines were well accepted by tasters, suggesting commercial potential. RM

39

[Influence of antioxidants on higher fatty acids during the storage of orange juice. II. Changes of the volatile compounds.] Die Beeinflussbarkeit der höheren Fettsäuren durch Antioxydantien während der Lagerung von Orangensaft. II. Veränderungen im Spektrum der Aromastoffe.

Bielig, H. J.; Feier, U.

Chemie Mikrobiologie Technologie der Lebensmittel 5 (3) 93-96, (iii) (1976, publ. 1977) [7 ref. De, en, fr] [Inst. für Lebensmitteltech., Tech. Univ., Berlin (West)]

Model orange juice systems, and orange juice, were treated with butylhydroxyanisole (BHA), butylhydroxytoluene (BHT), propylgallate (PG), α -tocopherol (α -T) or quercetin (QC) and the effects on the production of volatile aroma compounds were studied by GLC. The effects on the production of C6-alcohols, butyraldehyde, and C8- and C10-aldehydes are tabulated for the oxidation of model solutions containing palmitic, oleic, linoleic or linolenic acid for each antioxidant. The effects of each antioxidant were studied on the production of (i) hexanal, (ii) C8-, (iii) C10-, and (iv) C12-aldehydes and (v) C6 alcohols by bottled orange juices stored at 18°C for 7 months. Pronounced changes in volatile aroma compounds were observed during the 1st 2 months' storage, and the results were not comparable with the effects observed in model solutions. BHA and PG seemed to be the most effective for inhibiting the formation of off-flavour compounds; BHA influenced (i), (ii) and (v) contents, and PG influenced (i), (iii), (iv) and (v) contents. α -T had no observable effect, despite significant results in model solutions. BHT had no significant effects and QC inhibited the formation of (i) and (v). Controls stored at 4° or 18°C showed great differences in contents of some aroma compounds. [See preceding abstr. for part I.] DIH

40

Determination of diacetyl in beer by gas chromatography with flame-ionization detection.

Barcelo, C.; Gassiot, M.; Ferrer, M.

Journal of Chromatography 147, 463-469 (1978) [10 ref. En] [Sec. de Cromatografia de Gases del Dep. de Química Analítica, Inst. Químico de Sarria, Barcelona 17, Spain]

The use of a post-column containing boric acid is proposed for the selective retention of ethanol, which permits the detection of small amounts of diacetyl without the interference of the ethanol peak, making use of a conventional flame-ionization detector. The post-column was coated with 8% Carbowax 20M on Chromosorb P-AW plus 3% of boric acid. The technique enabled the detection of 10 parts/billion of diacetyl in a solution of ethanol or diacetyl in beer; it needs to be combined with mass fragmentography only when it is necessary to determine the diacetyl in beer at a level of <1 part/billion. AL

41

The composition of volatiles from different parts of *Allium tuberosum* plants.

Mackenzie, I. A.; Ferns, D. A.

Phytochemistry 16 (6) 763-764 (1977) [12 ref. En] [Dep. of Botany, Univ. of Nottingham, University Park, Nottingham NG7 2RD, UK]

The composition of the volatiles and the proportions of the different radicals liberated from *Allium tuberosum* leaf laminae, leaf bases, roots and rhizome were examined. The % of methyl and 2-propenyl (allyl) radicals present in the volatile disulphides liberated from chopped *Allium tuberosum* tissue was monitored. Quantitative differences were detected when different parts of the same plants were analysed. VJG

42

Volatile flavour components of licorice.

Fratini, C.; Bicchi, C.; Barettoni, C.; Nano, G. M. *Journal of Agricultural and Food Chemistry* 25 (6) 1238-1241 (1977) [7 ref. En] [Istituto di Chimica Farmaceutica e Tossicologica, Univ. di Torino, Torino, Italy]

63 compounds never found before in heated liquorice essential oil were identified by use of GLC, GLC-MS, and IR spectrometry. In addition, a few preliminary results on some components identified in unheated liquorice juice are reported. Many heated liquorice compounds are furan derivatives; this fact may be due to the occurrence during heating of pyrolysis and condensation reactions between sugars, in which liquorice roots are very rich. The most abundant components are: acetol, propionic acid, 2-acetylpyrrole, 2-acetylfuran, and furfuryl alcohol. None of the identified compounds is alone responsible for liquorice flavour, while on the other hand, total extract shows a typical liquorice aroma, indicating

that this may be due to an integrated response to the volatile mixture proper, rather than to the odour of 1 or 2 components. AS

43

[Analysis of aroma compounds of bread by gas chromatography-mass spectrometry.]

Gaschromatographische Massenspektalanalyse der Brot-Aromastoffe.

Obretenov, T.; Hadjieva [Khadzhieva], P.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 165 (4) 195-199 (1977) [22 ref. De, en] [Food Ind. Univ., 206 Lenin Boulevard, 4000 Plovdiv, Bulgaria]

The volatile compounds from extracts of white bread were analysed by a combined gas chromatography-MS technique. 29 compounds were identified by their mass spectra; of these compounds 20 have not previously been reported as components of bread aroma. 3 compounds together represented > 50% of the total: heptadecan-2-one (20%), 1,1-diethoxyethane (16.7%) and nitrobenzene (15.0%). All other compounds were present at < 7.0% of the total. DIH

44

Volatiles and oil quality.

Jackson, H. W.; Giacherio, D. J.

Journal of the American Oil Chemists' Society 54 (10) 458-460 (1977) [1 ref. En] [Kraft, Inc., Res. & Development, Glenview, Illinois 60025, USA]

A simple, rapid and versatile procedure for collecting and measuring volatiles from edible oils is described. The sample, distributed over glass wool in a heated Al U-tube, is purged with He; volatiles from the oil are trapped on a gas chromatographic column (Poropak P) held at room temp. On completion of purging, the column is disconnected from the U-tube, and a chromatogram of the volatiles is obtained. In tests on soybean oils aged at room temp. under normal fluorescent lighting excellent correlation was obtained between volatiles composition and organoleptic scores. HBr

45

Correlation of the flavor scores of vegetable oils with volatile profile data.

Williams, J. L.; Applewhite, T. H.

Journal of the American Oil Chemists' Society 54 (10) 461-463 (1977) [20 ref. En] [Kraft, Inc., Res. & Development, 801 Waukegan Road, Glenview, Illinois 60025, USA]

Refined, bleached and deodorized soybean oil samples, fresh or aged for 5 wk in the light at 22°C, were evaluated by sensory panels to obtain the initial flavour score, and identical oils were analysed by volatile profile analysis using direct gas chromatography. The data were analysed and correlated using the computerized, stepwise multiregression technique. High correlation between the volatile profile data and flavour scores was found. The most significant peaks which were

positively correlated with flavour score and those which were negatively correlated were obtained, and a prediction equation of flavour score was calculated from the volatile profile data. SP

46

Analysis of vegetable oils for flavor quality by direct gas chromatography.

Dupuy, H. P.; Rayner, E. T.; Wadsworth, J. I.; Legendre, M. G.

Journal of the American Oil Chemists' Society 54 (10) 445-449 (1977) [17 ref. En] [S. Regional Res. Cent., USDA, PO Box 19687, New Orleans, Louisiana 70179, USA]

Recently, a direct gas chromatographic method for examining volatiles in vegetable oils was reported [see FSTA (1974) 6 2N56 & (1977) 9 4N218]. The procedure stimulated the development of instrumental techniques for determining odour and flavour characteristics of vegetable oils. This symposium paper describes modifications of the original direct gas chromatographic procedure that substantially enhance its sensitivity and applicability. Profiles of volatiles for several experimental oils [hydrogenated soybean oils] obtained by the modified system are presented, together with mass spectral data characterizing significant flavour-related peaks. Regression analysis of the instrumental data, with oil flavour scores, indicates that reliable flavour characteristics of high- and low-quality vegetable oils may be obtained rapidly and efficiently by instrumentation. AS

47

Volatile flavor constituents of ovine adipose tissue.

Caporaso, F.; Sink, J. D.; Dimick, P. S.; Mussinan, C. J.; Sanderson, A.

Journal of Agricultural and Food Chemistry 25 (6) 1230-1234 (1977) [27 ref. En] [Dep. of Food Sci., Pennsylvania State Univ., University Park, Pennsylvania 16802, USA]

In an effort to increase the use of sheep meat, this study was designed to isolate and identify compounds from ovine subcutaneous adipose tissue (Panniculus adiposus) which contribute to the characteristic flavour of the meat. Samples were taken from 3 Suffolk wether lambs and subsequently steam deodorized, extracted, fractionated, and analysed. Olfactory and gas chromatographic analyses confirmed that the bulk of the flavour volatile compounds were in the neutral fraction, some in the acidic fraction, but little or none were detected in the basic fraction. Gas chromatographic-MS analysis of the neutral fraction resulted in the identification of 51 compounds: 26 aldehydes, 12 ketones, 6 lactones, 4 alcohols, and 3 cyclics. 39 of these compounds are reported for the 1st time as constituents (some tentative) of ovine fat volatiles. Although no single neutral fraction compound identified could be shown to be primarily responsible for lamb/mutton flavour, 14 (10 aldehydes, 3 ketones, and 1 lactone)

are suggested as important contributors to the overall flavour quality. AS

48

Roasted lamb fat: basic volatile components. Buttery, R. G.; Ling, L. C.; Teranishi, R.; Mon, T. R. *Journal of Agricultural and Food Chemistry* 25 (6) 1227-1229 (1977) [15 ref. En] [W. Regional Res. Cent., USDA, Berkeley, California 94710, USA]

The basic fraction from the steam volatile oil obtained from roasted lamb fat was analysed by the combination of glass capillary column gas chromatography and MS. 12 alkylpyridines, 12 alkylpyrazines, and 2 alkylthiazoles were characterized. The major component of the basic fraction was 2-pentylpyridine. Other unusual compounds characterized included 5-methyl-2-pentylpyridine, 5-ethyl-2-pentylpyridine, 2-butylpyridine, 2-hexylpyridine, and 3-pentylpyridine. AS

49

[Effect of type of muscle and fat tissue on accumulation of volatile carbonyl compounds in sausages.]

Kenzhebekov, P. K.; Sharipova, F. S.; Ul'yanov, S. D.; Momyshev, A. A. *Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya* No. 3, 25-28 (1977) [4 ref. Ru] [Semipalatinskii Filial Dzhambul'skogo Tekhnologicheskogo Inst. Legkoi i Pishchevoi Promyshlennosti, Semipalatinsk, USSR]

The effects of the type of meat and fat, and of the quantitative ratio of meat and fat tissue, on the composition of volatile carbonyl compounds in individual types of sausages were studied, in relation to the contents of these in the raw materials (horsemeat, beef, mutton, pork fat). The processing technology is a major factor influencing the microbiological and enzymic processes taking place in the sausages during ripening; the intensity of accumulation of aromatic substances is particularly affected. The losses of volatile carbonyl compounds during storage are lower in boiled than in smoked sausages. STI

50

Twenty-five years of flavor research in a food industry.

Keppler, J. G.

Journal of the American Oil Chemists' Society 54 (10) 474-477 (1977) [29 ref. En] [Unilever Res., Vlaardingen, Netherlands]

A brief review is given of the main lines of flavour research carried out by Unilever (Netherlands), particularly into lactones in fatty foods and causes of off-flavours (oxidation, microbial deterioration, temp., light). HBr

51

Recent progress in essential oils.

Lawrance, B. M.

Perfumer & Flavorist 2 (3) 53-56 (1977) [many ref. En]

The series [for previous work see FSTA (1978) 10 5T144] is continued with accounts of recent investigations on cinnamon oil, cinnamon leaf oil, coriander oil, lemongrass oil, myrtle oil, star anise oil, tarragon oil and tolu balsam. RM

52

Direct gas chromatographic analysis of molasses and fermented mash.

Rosado, E.; Batiz, H.

Journal of Agriculture of the University of Puerto Rico 60 (4) 585-591 (1976) [En, es] [Agric. Exp. Sta., Mayagüez Campus, Univ. of Puerto Rico, Rio Piedras, Puerto Rico]

A gas chromatographic system using a column of 5% Carbowax 20M on Chromosorb W, a/w 60/80 mesh, a glass precolumn with the same stationary phase and an external dismountable injection trap was constructed and tested for the analysis of fermented rum mash with fractional distillation of the fermented mash prior to direct injection. 34 peaks were detected, of which 14 were identified as acetaldehyde, ethyl acetate, methyl acetate, acetal, ethyl alcohol, n-propyl alcohol, isobutyl alcohol, isoamyl alcohol, butyl alcohol, isoamyl acetate, amyl alcohol, furfuraldehyde, furfuryl acetate and furfuryl alcohol. This technique can be applied to analysis of slops or similar mixtures with suspended solids. SP

53

[Gas chromatographic determination of volatile phenols in barley, green malt, kilned malt, wort and beer.] Gaschromatographische Bestimmung einiger flüchtiger Phenole in Gerste, Grünmalz, Malz, Würze und Bier.

Kieninger, H.; Boeck, D.

Brauwissenschaft 30 (12) 357-360 (1977) [13 ref. De, en, fr] [Wissenschaftliche Sta. für Brauerei in München e.V., Munich, Federal Republic of Germany]

A procedure for isolation and detn. of volatile phenols in barley, malt, wort and beer is described. The volatile phenols are separated by steam distillation, followed by extraction with diethyl ether; the ether extract is then cleaned-up on an alumina column (elution successively with n-pentane, a 9:1 n-pentane/diethyl ether, and diethyl ether); and the ether eluate is then silylated using N, O-bis(trimethylsilyl)trifluoroacetamide, and analysed by GLC using a 5% Carbowax 20M on Chromosorb G AW DMCS (80-100 mesh) column. This procedure was used in studies on volatile phenols in barley, green malt, kilned malt, wort and beer; tables and chromatograms are given showing

changes in concn. of guaiacol, 4-ethylguaiacol, 4-methylguaiacol, phenol, 4-ethylphenol, isoeugenol, o-cresol, m-cresol and p-cresol at the various stages of processing. Volatile phenol concn. decreased by > 50% from barley to green malt, and increased to approx. the same as those in the barley, during kilning. Volatile phenol concn. in beer were much lower than those in the corresponding wort. Direct kilning gave volatile phenol concn. approx. 10% higher than those achieved by indirect kilning. AJDW

54

Identification of the major volatile components of cooked beets.

Parliment, T. H.; Kolor, M. G.; Maing, I. Y. *Journal of Food Science* 42 (6) 1592-1593 (1977) [5 ref. En] [General Foods Tech. Cent., White Plains, New York 10625, USA]

The volatile constituents of cooked beets (*Beta vulgaris*), obtained by distillation-extraction of the beets, were separated by gas chromatography and subjected to IR and MS analysis, and 17 components were identified. A unique feature of this vegetable is the high concn. of 4-methylpyridine and pyridine, which constitute about 60% of the total volatiles. Other components present at > 1% level include dimethyl sulphide, isovaleraldehyde, ethanol, isopentanol and furfural. The occurrence of geosmin and 2-methoxy-3-secbutylpyrazine were confirmed; the low flavour thresholds of these compounds suggest they play a role in beet flavour. IFT

55

Effects of different drying methods on quality and content of aromatic volatiles in dried mushrooms *Agaricus bisporus*.

Sulkowska, J.; Kaminski, E. *Acta Alimentaria Polonica* 3 (4) 409-425 (1977) [4 ref. En, pl] [Cent. Lab. Przemyslu Koncentratow Spozywczych, Poznan, Poland]

Agaricus bisporus were dried by (i) traditional blow-air drying, (ii) freeze-drying, (iii) fluidization drying, (iv) roller-drying and (v) spray-drying, and the contents of aromatic volatiles were compared with those of fresh *A. bisporus*; data are tabulated. 3-octanone, 3-octanol, 1-octen-3-ol, benzaldehyde and benzyl alcohol were found in all mushroom distillates, and 3-methylbutanol in fresh (i) and (v). 1-octen-3-ol, the characteristic mushroom aroma compound, showed losses of about 90% depending on drying method (84.87% in fresh vs. 1.09-7.5% in dried mushrooms) and benzaldehyde accounted for 3-44% of all volatiles and benzyl alcohol for 37-64% in dried mushrooms (vs. 0.36 and 0.45% resp. in fresh mushrooms). In sensory tests, addition of 1-octen-3-ol to mushroom soup improved its flavour and aroma, but addition of benzyl alcohol had adverse effects. The best quality dried mushrooms were obtained by (ii) and by vacuum-roller drying (iv) with addition of a cereal slurry. AL

56

Correlation of volatile components of raw peanuts with flavor score.

Brown, M. L.; Wadsworth, J. I.; Dupuy, H. P.; Mazingo, R. W.

Peanut Science 4 (2) 54-56 (1977) [10 ref. En] [S. Regional Res. Cent., New Orleans, Louisiana 70179, USA]

The direct gas chromatographic procedure for analysis of the volatiles of peanut butter and other food products was applied to raw peanuts. A glass liner packed with ground, raw peanuts was placed in the heated inlet of a gas chromatograph and allowed to remain in place while the volatiles distilled out of the sample onto the head of a cool column. The liner was then removed and temp. programming was begun. Raw, Virginia type peanuts from the 1974 and 1975 harvests were analysed, and some gas chromatographic data were correlated with flavour scores of the roasted peanuts. Ethanol was the predominant volatile component, and it tended to increase as flavour quality decreased. The correlation coeff., significant at the 1% level, between the flavour scores and the ratios of ethanol-to-methanol and ethanol-to-total volatiles were -0.87 and -0.88, resp. AS

57

Carbonyl compounds in starter, unfermented and fermented dough, and 'Balady' bread.

Hamed, M. G. E.; Foda, Y. H.; Abd-El-Al, A. T.; El-Samahy, S. K.

Egyptian Journal of Food Science 1 (2) 195-202 (1973 (publ. 1974) [7 ref. En, ar] [Food Tech. Dep., Nat. Res. Cent., Cairo, Egypt]

In an attempt to identify the volatile carbonyl compounds which contribute to the flavour of balady bread, samples of starter, unfermented dough, fermented dough and bread were obtained from 6 bakeries in Cairo (Egypt). Carbonyl compounds were extracted from the samples by homogenizing in cold distilled water followed by vacuum distillation. Distillates were collected in a saturated solution of 2,4-dinitrophenylhydrazine in 2N HCl (in ice) and the 2,4-dinitrophenylhydrazones formed were extracted with benzene, conc. and subjected to TLC and paper chromatography. The following carbonyl compounds were identified: formaldehyde, acetaldehyde, propionaldehyde, furfural, hydroxymethylfurfural, acetone and diacetyl; a further 5 compounds could not be identified because authentic samples were not available. Results indicate that generally the same carbonyl compounds occurred throughout the breadmaking process but that their concn. changed. No new carbonyl compounds were formed during baking but in some cases the concn. of furfural and hydroxymethylfurfural increased. No marked differences in carbonyl compound content were noticed for samples from different bakeries. JA

58

[Separation of flavouring and aroma-forming substances from horseradish.]

Karwowska, K.; Tokarska, B.

Prace Instytutów i Laboratoriów Badawczych Przemysłu Spożywczego 27 (1) 7-12 (1977) [9 ref. Pl, ru, en] [Inst. Przem. Fermentacyjnego, Warsaw, Poland]

Investigations were carried out to find a method of determining the isolates from the horseradish. The material is pulped in a Rietz hammer mill (0.48 mm mesh). The isolate is obtained by extraction with dichlorodifluoromethane. 97.6% of the active substances are obtained in the form of a yellowish thick liquid, with a pungent characteristic smell. It contains on average 19% S compounds, the main constituent is the thioglucoside sinigrin, which changes into allylisothiocyanate due to enzymatic hydrolysis. This compound is characteristic of horseradish. Organoleptically, 3 g of the extract correspond to 1 kg of the raw material. The extraction residues can be used as fodder. STI

59

[Efficient laboratories in the food industry, discussed in relation to gas chromatography as an example.] Leistungsfähige Laboratorien im Lebensmittelbereich - dargestellt am Beispiel der Gaschromatographie.

Trommsdorff, H.

Zeitschrift für Lebensmittel-Technologie und -Verfahrenstechnik 29 (2) 52-55 (1978) [24 ref. De]

The importance of use of modern accurate methods for food analysis is discussed, with reference to possible problems with introduction of new methods, and recommendations for organization of an analytical laboratory. Brief details are listed (column type, stationary phase, carrier gas, column temp., detector type) of GLC methods for detn. of various additives, contaminants and constituents in a range of foods and beverages. AJDW

60

Comparison of extracting solvents for typical volatile components of eastern wines in model aqueous-alcoholic systems.

Cobb, C. S.; Bursey, M. M.

Journal of Agricultural and Food Chemistry 26 (1) 197-199 (1978) [7 ref. En] [Venable & Kenan Chem. Lab., Univ. of N. Carolina, Chapel Hill, N. Carolina 27514, USA]

A model system containing a total of 9 (0.028% w/w) previously reported Concord (*Vitis labrusca*) flavour compounds in a 12% (v/v) ethanol-water mixture was extracted with 4 solvents. The diethyl ether, dichloromethane, 2-methylbutane, and Freon 11 (trichlorofluoromethane) extracts were conc. by rotary evaporation and analysed by GLC. Freon 11 extracted and made available for analysis more of the flavour compounds than the other solvents, being exceeded by dichloromethane only for 3-

methyl-1-butanol. Within the error of the experiment, the presence of 4.4% (w/w) sucrose did not alter extraction and recovery efficiencies. AS

61

[Objective evaluation of the quality of brandy, with special reference to gas chromatography.] Zur objektiven Qualitätsbeurteilung von Weinbrand unter besonderer Berücksichtigung der Gaschromatographie.

Pietsch, H.-P.; Kasprick, D.; Freimuth, U.

Lebensmittel-Industrie 24 (9) 409-415 (1977) [33 ref. De, en, ru] [Hygiene-Inst., Dresden, German Democratic Republic]

A gas chromatographic method was developed for separation, identification and detn. of volatile aroma compounds in brandies; this technique was used in studies on samples of 70 domestic and imported brandies. The results show that the sum of concn. of 2-methylpropanol-1, of 2-methylbutanol-1 and of 3-methylbutanol-1 may be used as an index of quality. Min. values for classification of brandies into quality grades on the basis of their ethyl acetate and higher alcohol concn. are recommended. GLC analyses were found to be closely correlated with results of sensory evaluation; headspace studies confirmed this interrelation. Ethyl acetate was a good index of the 'fruity ester-like' characteristic of the aroma; total amyl alcohol content was a good index of the 'wine-like' characteristic. IN

62

[Isolation and concentration of volatile substances in roasted coffee for gas chromatographic analysis. Comparison of methods.] Die Isolierung und Konzentrierung flüchtiger Stoffe des Röstkaffees für die gas-chromatographische Analyse - ein Methodenvergleich.

Rödel, W.; Schrödter, R.; Zöll, D.; Steiniger, L. *Nahrung* 21 (8) 719-724 (1977) [6 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

Comparative studies were conducted on 8 methods for isolation and concn. of coffee volatiles for subsequent analysis. The methods included: headspace sampling of ground coffee or coffee infusion; isolation under vacuum, with collection in a cold-finger and dissolution of the condensate in Freon or a 2:1 ether/pentane mixture (with or without a concentration in a Vigreux column); and isolation by steam distillation followed by extraction with Freon or ether/pentane (2:1) with or without concentration on a Vigreux column. Tables of results are given, including data for the s.d., time requirements and number of peaks detected during subsequent GLC analysis of concentrates obtained by the various methods. The best overall result (s.d. 6.5%, time required 7.76 h, 30 peaks detected) was given by steam-distillation followed by extraction with ether/pentane (2:1) with concn. by distillation. Headspace methods were rapid and gave low s.d., but gave only 6-7 peaks, as compared to >30 with other techniques. The relation of peak area ratios to coffee quality is briefly considered. AJDW

3

S-containing aroma compounds in beer, and their formation.] Schwefelhaltige Aromastoffe in Bier und deren Genese. [Lecture] Schreier, P.; Drawert, F.; Krämer, G. *Lebensmittelchemie und Gerichtliche Chemie* 32 (1) 12 (1978) [De] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

GLC studies (with on-column enrichment, and use of an S-specific flame ionization detector) on top- and bottom-fermented beers are briefly described. Ranges of values for the concn. of major S-containing constituents were ($\mu\text{g/L}$): dimethyl sulphide 20-115; dimethyl disulphide 1-4; methionol 345-3175; and the acetic acid ester of methionol 5-180. Other S-containing constituents identified included methional, 3-methylthiopropionic acid and its ethyl and methyl esters, 2-methylthiophan-3-one, 2-acetylthiazole, and 2-thiazolyethanol. Top- and bottom-fermented beers could be differentiated on the basis of their contents of S-containing constituents. Model studies showed that *Saccharomyces cerevisiae* converted 60% of available methionine (added as the sole N source) to methionol. Changes in concn. of S-containing constituents during wort boiling and fermentation are discussed, together with the significance of S-containing constituents for the flavour of beer. [See FSTA (1978) 10 7A382.] AJDW

64

The roles of thiamine and thiamine pyrophosphate as precursors of thiazole flavourants in grape spirits. Strauss, C. R.; Williams, P. J.

Chemistry and Industry No. 7, 232-233 (1978) [11 ref. En] [Australian Wine Res. Inst., Glen Osmond, South Australia 5064, Australia]

Gas chromatographic (GC)-MS analysis of the extracted organic bases from a number of grape wine distillates has shown the presence of 2 thiazole flavour compounds, (i) 4-methyl-5-vinylthiazole and (ii) 4-methyl-5-(β -hydroxyethyl)thiazole. GC analysis of 20% aqueous solutions of (iii) thiamin chloride and (iv) thiamin pyrophosphate chloride at injector temp. of 280° and 350°C showed that pyrolysis of the hydrochloride salt of (iii) produced substantial amounts of (ii) and traces of (i), while pyrolysis of (iv) produced (i) as the major volatile product, particularly at 350°C. The injector metals, Cu or stainless steel, had no major influence on decomposition rate or product yield, but these were highest for conversions to (i) for Cu at 350°C. (iv) is the likely precursor of flavourant (i) in cooked or roasted foods rich in the cofactor (iv). (i) could occur in grape wine distillates due to thermal degradation of the intracellular cocarboxylase of the suspended yeast cells. Also (ii) in spirits is probably derived from slow decomposition of (iii) and also by the action of SO_2 on (iii) and (iv). AL

65

[Aroma compounds in various apple varieties and ciders made therefrom.] Aromatische Stoffe in verschiedenen Apfelsorten und den daraus hergestellten Weinen.

Mikeladze, G. G.; Kerezelidze, Z. G. *Lebensmittel-Industrie* 24 (10) 459-464 (1977) [13 ref. De, en, ru] [Dep. of Food Tech., State Univ., Tbilissi, USSR]

Gas chromatographic studies were conducted on apples of the var. Banana, Champagner Reinette, Winter Gold Pearmain and Kechura, and on ciders manufactured therefrom. 42 flavour volatiles were identified in the apples. The var. studied differed principally in ester content; this was correlated with the intensity and character of the apple aroma, and could therefore be used as an index of apple quality. The following additional volatiles were formed during alcoholic fermentation; caprylaldehyde, γ -butyrolactone, dodecanol-1,2,3-butyleneglycol methyl laurate, lethyl lactate, oenanthic acid, caprylic acid and isohexanol. A non-identified substance was also formed. Ciders made from the apple var. differed considerably in concn. of volatile constituents. IN

66

Cereal volatiles, a review. [Review]

Maga, J. A.

Journal of Agricultural and Food Chemistry 26 (1) 175-178 (1978) [25 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado 80523, USA]

Although cereal grains constitute an important portion of worldwide diet, little is known of their volatile composition, especially in the raw state. This review summarizes volatile compounds identified to date in corn, oats, rye, wheat, triticale, barley and rice and points out potential areas for further investigation for the flavour chemist. AS

67

[Contents of amino acids, sugars and volatile carbonyl compounds in the process of making bread with dried whey addition.]

Chumachenko, N. A.; Demchuk, A. P.; Markianova, L. M.; Roiter, I. M.

Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 4, 58-61 (1977) [7 ref. Ru] [Kievskii Tekh. Inst. Pishchevoi Promyshlennosti, Kiev, USSR]

The more intensive fermentation produced by the addition to dough of dried milk whey, and the improvement of taste, aroma and colour of the bread, are due to changes in amino acids and sugars, and to the formation of volatile carbonyl compounds. The amino acids were determined using paper chromatography (butanol:acetic acid:water, 4:1:1 or 4:1.5:0.5) and the volatile carbonyl compounds were determined by distillation and, after reaction with 2,4-dinitrophenylhydrazine, using spectrophotometry.

Considerable decreases in sugars and amino acids were observed in all the stages of making the bread with dried whey addition. During dough fermentation and baking, carbonyl compounds accumulated. Results could explain the improvement of vol., crust colour and aroma of the bread with dried milk whey addition. STI

68

[Nitrosamines in cheese?]

Elgersma, R. H. C.

Zuivelzicht 70 (11) 265-267 (1978) [10 ref. Nl, en] [Nederlands Inst. voor Zuivelonderzoek, Ede, Netherlands]

In view of recent reports that cheese imported into Canada contained up to $< 20 \mu\text{g}$ volatile N-nitrosamines/kg, analyses were carried out at 3 laboratories (in Canada, Netherlands and UK) on Gouda and Baby Edam cheeses shortly after manufacture, after storage in the Netherlands or UK, and after export and normal retailing in Canada. The Canadian laboratory, using GLC/MS, detected $1\text{--}2 \mu\text{g}$ N-nitrosodiethylamine/kg in 2 of 14 samples (one freshly made and the other retailed in Canada). This amount corresponded to the detection limit of the method used. The other laboratories, using more sensitive methods (GLC with a thermal energy analyser, detection limit about $0.01 \mu\text{g/kg}$), detected only N-nitrosodimethylamine (which was not detected by the Canadian laboratory) in very small amounts, $< 0.15 \mu\text{g/kg}$. The conditions of storage and export did not appear to affect nitrosamine content, as was confirmed by a further similar study on cheeses purchased at random in Canada. Nitrosamine content was not related to nitrate content of the cheese or to the amount of nitrate used in manufacture. ADL

69

[Seasoning agent.]

Asahi Chemical Industries Co. Ltd.

Japanese Patent 5 249 060 (1977) [Ja]

Process for the extraction of flavours from foods such as coffee, tea, bonito, mushrooms by contact with an aqueous dimethyl ether solution is described. The extracts are treated to recover flavour components for use as seasoning agents. IFT

70

Extracting foods with a dimethyl-water mixture.

Yano, N.; Fukinbara, I.; Takano, M. (Asahi Kasei Kogyo Co. Ltd.)

United States Patent 4 069 351 (1978) [En]

A method for obtaining mixtures containing hydrophilic and lipophilic flavour- and odour-producing components of food substrates involves extracting the foods with a liquid dimethyl ether-water extract mixture under defined conditions. IFT

71

Continuous fermentation and formation of some flavour compounds of beer.

Mäkinen, V.

Dissertation Abstracts International, C 37 (3) 558 (1977) [En] [Univ. of Helsinki, Fabianinkatu 33, 00170, Helsinki 17, Finland]

In the chemostat fermentation of beer, O_2 acts as the growth-limiting factor for yeast, and the energy source as the fermentation-limiting factor. Chemostat conditions favour non-flocculent yeast. In continuous fermentation more fusel alcohols, carbonyl compounds and organic acids are formed than in conventional batch fermentation; also acetaldehyde, vicinal diketones and organic acids accumulate in larger amounts. Very close attention must be paid to the selection of the yeast strain, as this has the greatest influence on flavour compounds in beer. The method is unsuitable for manufacture of modern lager beer unless a radical change is made in the wort composition. AS

72

[Aromatized wines of Moldavia]

Vishnevskii, E. F.

Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii 32 (7) 30-33 (1977) [Ru] [Sovkhoz-Zavod im. Dzerzhinskogo Dubossarskogo Raiona MSSR, USSR]

'Buket Moldavii' and 'Utrennaya roza' vermouths produced in Moldavia, are flavoured by addition of extracts of > 20 kinds of plants occurring on the banks of the river Dniester. Among the most important of these plants is wormwood, stimulating the appetite and the action of the stomach. Thyme has a calming effect and the effects of many other herbs are listed. STI

73

Mixed columns made to order in gas chromatography. IV. Isothermal selective separation of alcoholic and acetic fermentation products.

Cabezudo, M. D.; Gorostiza, E. F.; Herraiz, M.; Fernandez-Biarge, J.; Garcia-Dominguez, J. A.; Molera, M. J.

Journal of Chromatographic Science 16 (2) 61-67 (1978) [27 ref. En]

The FORTRAN program described in Part I [Journal of Chromatographic Science (1969) 7, 305-312] has been modified so that it may either find the best combined phases made up from 2, 3, or 4 simple phases for the isothermal separation of all the solutes contained in a mixture, or may find the best combined phases for the separation of only a group of selected mixture components. The program has been applied to the separation by direct injection of the 20 more important components (b.p. $< 145^\circ\text{C}$) found in alcoholic and acetic fermentation samples. A couple of mixed bed columns, ESCARTO 5905 (5% Squalane, 90%

Carbowax-300, and 5% di-2-ethylhexyl sebacate) and UCAR 5050 (50% Ucon LB 550X and 50% Carbowax-300), have been found that achieve the separation of the 20 components plus 4 proposed internal standards in samples containing up to 40% ethanol. Comparison with other analytical procedures found in the literature shows that the couple of columns found by the computer represents the best choice for the detection and quantitative detn. of volatile components of wine and distillates, as well as cognac, brandy, rum, whisky, beer, and vinegar. Chromatograms showing the capabilities of the 2 columns are included.

AS

74

[Problem of vanillin determination in distillates and wines.]

Nalimova, A. A.; Masalova, A. P.

Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii 32 (12) 27-29 (1977) [Ru] [Vses. Nauchno-issled. Inst. Vinodeliya i Vinogradarstva 'Magarach', Yalta, USSR]

Gas chromatography with a 2 m high glass column, diam. 3 mm, packed with 5% Xe-60, using N-AW-HMDS Chromaton at 170°C and He flow rate of 100 ml/min, was used for vanillin detn. Methylene chloride was used as solvent after the alcohol had been distilled off. Recovery of a standard vanillin addition was 91-100%. The time needed for the preparation of samples was 2-3 h, and the detn. took 30 min. The mean-square deviation was 0.108 mg/l., and the sensitivity of the method 0.05 mg vanillin/l. in the original sample. Vanillin content in brandies was within the limits of 0.263-1.070 mg/l., being directly dependent on the age of the brandy. STI

75

[Odourous compounds in water supplies. Odourous material of *Streptomyces* strain A, isolated from sediment in Sengari reservoir.]

Ito, Y.; Matsuda, Y.; Hamaguchi, A.

Journal of Hygienic Chemistry [Eisei Kagaku] 23 (5) 325-329 (1977) [7 ref. Ja, en] [Public Health Res. Inst. of Kobe City, Kano-cho, Ikuta-ku, Kobe, Japan]

Streptomyces strain A, isolated from sediment in the Sengari reservoir, the main water supply for Kobe city, was cultured in malt/yeast extract/agar medium at 25°C for 10 days. The culture and the medium were subjected to steam distillation to concentrate the volatile odiferous substances. The distillate was systematically extracted to give fractions I (neutral), II (phenolic), III (acid), IV (basic) and V (amphoteric). From the retention time in gas chromatographic analysis and the result of gas chromatography/MS, geosmin and 2-methylisoborneol (musty odour substances) and 2-phenylethanol (aromatic, flowery odour) were identified in I, and phenol and m-cresol were

identified in II. An unknown substance with a musty odour was isolated from IV. III and V produced no gas chromatographic peaks. AS

76

Recent developments in low temperature steam distillation of hop oil.

Pickett, J. A.; Peppard, T. L.; Sharpe, F. R.

Journal of the Institute of Brewing 83 (5) 302-304 (1977) [5 ref. En] [Brewing Res. Foundation, Nutfield, Redhill, Surrey, UK]

An apparatus is described for steam distillation of milled hops at 25°C and collection of the resulting aqueous emulsions of hop oil. The apparatus incorporates some improvements over an earlier design [see Proceedings of the European Brewing Convention Congress (1975), p. 123]. A water reservoir is connected to the base of a thick-walled glass column, which can be isolated from the reservoir by a tap. The column holds the hop bed (≤ 4.5 kg milled hops) which is supported by a bottom baffle (illustrated); the dead space above the hops is filled by a top baffle (also illustrated). Baffle design is chosen to reduce channelling in the hop bed. The top of the column (via a tap) is connected to 2 sequential traps cooled to -78°C, 1 trap at liquid N₂ temp. and finally the vacuum pump. A vacuum of 0.008 mm Hg may be maintained at the pump. The new design has increased extraction indices and reduced distillate vol. compared to the older one. Emulsions having oil contents of approx. 0.96% (w/w) are produced, and beers treated with emulsions from the new and old designs (at 1.5 p.p.m. hop oil) were not distinguishable in a multiple comparison taste test. DIH

77

[Volatile carbonyl compounds in white rice bran.]

Koizumi, T.; Miyahara, T.; Takeda, M.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 72 (11) 818-821 (1977) [20 ref. Ja, en] [Tokyo Univ. Agric., Setagaya-ku, Tokyo, Japan]

2,4-dinitrophenylhydrazones of carbonyl compounds prepared by ether extraction of white rice bran were heated with o-phthalic acid to liberate free carbonyl compounds, which were analysed by gas chromatography (headspace method). Acetaldehyde, n-propionaldehyde, acetone, iso-butyraldehyde, n-butyraldehyde, diacetyl, methyl ethyl ketone, iso-valeraldehyde, diethyl ketone, n-valeraldehyde, n-capronaldehyde and acetoin were identified. Higher concn. of ferricyanide-reducing compounds and carbonyl compounds were found in sake made from white rice bran than in sake made from white rice. YN

78

The development of flavour during ageing of alcoholic beverages. (In 'Sensory properties of foods' [see FSTA (1978) 10 8A456].) [Lecture]

Salo, P.; Lehtonen, M.; Suomalainen, H.
pp. 87-108 (1976) [25 ref. En] [Res. Lab. of the
State Alcohol Monopoly (ALKO), Box 350, SF-
00101 Helsinki 10, Finland]

The effects of ageing and the composition of oak
barrels on the flavour and content of aromatic
aldehydes, carbohydrates, lactones, phenolic
compounds, steroids and compounds formed by
chemical reactions during ageing of whisky and
other alcoholic beverages are reviewed. The
deterioration of beer taste during ageing is also
mentioned. AL

79

[Comparative studies on the aroma of raw and
cooked mushrooms (*Agaricus bisporus* L.)]

Card, A.; Avisse, C.

Annales de Technologie Agricole 26 (3) 287-293
(1977) [9 ref. Fr, en] [Sta. de Tech. des Produits
Vegetaux, INRA, Cent. de Recherches de Dijon, 7,
Rue Sully, BV 1540, 21034 Dijon Cedex, France]

Studies on extraction and GLC/MS identification
of volatile aroma compounds in (i) raw and (ii)
cooked mushrooms. None of the solvents tested
(pentane, hexane, diethyl ether, benzene,
methylene chloride, and 1,1,2-
trichlorotrifluoroethylene) were fully satisfactory;
however, pentane, which gave the best results, was
used. The GLC analysis was conducted using a 2.5%
Carbowax 20M on Chromosorb W column.
Chromatograms are given, together with a table
showing volatiles identified in (i) and (ii). 14
compounds were identified in (i); all these, together
with 3 other compounds, were present in (ii). The
main compounds responsible for the aroma of raw
mushrooms were found to be octanol-3, octen-1-ol-3
and octen-2-ol-1. In addition to these,
benzaldehyde, octanone-3, octene-1-one-3 and
furans are responsible for the aroma of cooked
mushrooms. AJDW

80

The aroma of some berries in genus *Rubus*. (In
'Sensory properties of foods' [see FSTA (1978) 10
8A456]) [Lecture]

Pyysalo, T.; Jonkanen, E.

pp. 163-166 (1976) [6 ref. En] [Tech. Res. Cent.
of Finland, Food Res. Lab., SF-02150 Espoo 15,
Finland]

Aroma research on (i) cloudberry (*Rubus
chamaemorus* L.) and (ii) arctic bramble (*R.
arcticus* L.) and inheritance of (ii) volatiles by
crossings of raspberry (*R. idaeus* L.) with (ii) is
reviewed and discussed. Qualitative and
quantitative differences between the volatiles of
heated and unheated berries were evaluated and
heat-induced changes in the % of different
compound groups in the neutral fraction are
tabulated [See also FSTA (1977) 9 5J765.] AL

81

The aroma of fresh mushrooms. (In 'Sensory
properties of foods' [see FSTA (1978) 10 8A456])
[Lecture]

Pyysalo, H.; Honkanen, E.

pp. 159-162 (1976) [4 ref. En] [Tech. Res. Cent.
of Finland, Food Res. Lab., Biologinkuja 1, SF-
02150 Espoo 15, Finland]

A study was carried out on the aroma of 7 wild
mushrooms commercially important in Nordic
countries, (i) *Cantharellus cibarius*, (ii) *Gyromitra
esculenta*, (iii) *Boletus edulis*, (iv) *Lactarius
trivialis*, (v) *L. rufus*, (vi) *L. torminosus* and (vii)
Agaricus bisporus. About 80 volatile compounds
(listed) have been identified in the fresh
mushrooms. The most important volatiles and their
relative concn. in the 7 mushrooms are shown in a
table, as are the threshold values and odour
characteristics. The wild mushrooms were found to
contain considerably higher amounts of mushroom-
like aroma compounds than cultivated
champignons. Mushroom (vi) is considered inedible
in Germany but when cooked is commonly eaten in
Nordic and eastern countries, and (ii) is highly toxic
when fresh, but is commonly eaten after cooking.
AL

82

Concentration of oxygenated flavor compounds in
citrus oils. [Lecture]

Braddock, R. J.; Kesterson, J. W.

*Proceedings of the Florida State Horticultural
Society* 89, 196-198 (1976) [9 ref. En] [IFAS
Agric. Res. & Education Cent., PO Box 1088, Lake
Alfred, Florida 33850, USA]

The concn. of the major aldehydes present in
'Hamlin', 'Pineapple' and 'Valencia' orange oils;
'Temple', 'Dancy' tangerine, 'Orlando' tangelo, and
'Duncan' grapefruit oils and 'Valencia' essence oil
were determined. The most predominant aldehydes
were octanal and decanal. Ratios of total aldehydes,
esters, alcohols, and organic acids present in the oils
were studied and found to be very important to the
flavour characteristics of the individual oils. Cold
pressed 'Valencia' oil showed a higher
aldehyde:ester ratio than 'Valencia' essence oil, the
higher ester contents of the essence oil accounted
for a more juice-like aroma of the latter. [See
FSTA (1978) 10 8J1164.] AS

83

Precursors of toffee flavour.

Sharp, T. M.

Dissertation Abstracts International, C 37 (3) 596
(1977) [En] [Univ. of Surrey, Guildford, Surrey,
UK]

The development of the characteristic flavour of
toffee was investigated by a number of different
methods. Macroscopic changes in the constituents
of toffee due to the cooking process were measured
by standard methods and related to the chemical

processes taking place in the system. The importance of reaction intermediates (Strecker aldehydes and 5-hydroxymethylfurfural) in the development of toffee flavour was determined by the use of trained taste panels and chemical analysis involving extensive use of GLC. The role played by butter in the development of toffee flavour was investigated, with particular reference to aldehydes and carboxylic acids, by the use of trained taste panels and chemical analysis involving vacuum steam distillation techniques, followed by gas chromatography. AS

84

[Gas chromatographic separation and determination of aroma substances in yoghurt.]
Gosheva, B.

Molochnaya Promyshlennost' No. 12, 35-38 (1977) [8 ref. Ru] [Tsentrāl'naya Eksperimental'no-Proizvodstvennaya Lab. Molochnoi Promyshlennosti, Sofia, Bulgaria]

The purpose of the study was to determine which GLC column materials are most suitable for separation and detn. of volatile aroma components of yoghurt made according to Bulgarian Standard 12-72 using a Carlo Erba model D Fractovap gas chromatograph. Chromatograms of model mixtures of acetaldehyde, acetone, ethyl acetate, 2-butanone, diacetyl and ethanol are presented for 4 different column materials. It is concluded that polyethylene glycol 400 and Paropac Q are the most suitable for yoghurt aroma substances. No data on contents are presented. SKK

85

[Development of volatile carbonyl compounds in Kazakhstan raw sausage made from horsemeat.]
Ul'yanov, S. D.; Kenzhebekov, P. K.; Rskel'diev, B. A.; Goryaev, M. I.; Sharipova, F. S.
Myasnaya Industriya SSSR No. 2, 30-31 (1977) [4 ref. Ru] [Semipalatinskii Filial Dzhambul'skogo Tekh. Inst., Semipalatinsk, USSR]

Effects of use of starter cultures on formation of volatile aroma compounds in Kazakh raw dry sausages (made from horsemeat) were studied. 19 volatile carbonyl compounds were identified. Concn. of these constituents increased during the first 2-5 days of ripening; after 20 days of ripening, concn. of formaldehyde, isobutyraldehyde, butyraldehyde, crotonaldehyde and acrolein increased and concn. of glyoxal, propionaldehyde and capronaldehyde decreased as compared to control samples without added starter. The max. concn. of volatile aroma compounds is at approx. 20 days of ripening. After storage for 6 months, diethyl ketone and acetaldehyde disappear completely, whereas concn. of acetone increased. Sausages made with starter culture had a considerably higher content of carbonyl compounds than those made without starter. STI

86

Characterization of volatile flavor constituents of beef stew.

Peterson, R. J.

Dissertation Abstracts International, B 38 (2) 575: Order No. 77-17559, 171pp. (1977) [En] [Rutgers Univ., New Brunswick, New Jersey 08903, USA]

Volatile flavour constituents of fresh, frozen beef stew were isolated by flash vaporization, extraction of the aqueous volatiles with ethyl ether, concentration of the extract and repeated gas chromatography with different stationary phases until pure fractions were obtained. Fractions were identified using an IR-MS combination. 132 compounds were positively or tentatively identified. The flavour of fresh, frozen stew was not due to any single constituent. Comparison with volatile compounds from canned stew showed that frozen stew contained more alcohols, 2-alkenals, esters, lactones and ionones and less hydrocarbons and N- and S-containing heterocycles than canned stew. Addition of a mixture of pyridine (1.2 p.p.m.), 2,4,5-trimethyloxazole (1.2 p.p.m.) and benzothiazole (0.45 p.p.m.) to fresh, frozen beef stew or canned beef stew gave an undesirable flavour note. The 3 compounds are found exclusively or to a greater extent in canned beef stew volatiles. DIH

87

[Study of the volatile fractions of raw and heat-processed muscle tissue of hogs.]

Andropova, I. N.; Lyaskovskaya, Yu. N.

Myasnaya Industriya SSSR No. 2, 31-33 (1977) [14 ref. Ru] [Vses. Nauchno-issled. Inst. Myasnoi Promyshlennosti, USSR]

Elimination of nitrite from the brine had an adverse effect on the quality and aroma of the product. Chromatographs of overall aroma exhibited an increase in some of the peaks. The range of fluctuations in the sensory evaluation of the aroma of the roast meats studied was between 4.9-7.1 points. Statistically reliable positive and negative correlations of the peak heights, calculated on the basis of chromatographs of the volatile substances and sensory evaluations of the aroma of the ham tissue, were established. From these correlations the assumption was made that the muscle tissue of brined and heat-processed products contains a range of volatile substances, whose ratios affect the aroma formation of the product. The volatile fractions of the aroma were isolated using 2,4-dinitrophenylhydrazine to form non-volatile derivatives. Identification of the nature of the fluctuations in peak magnitude in the overall aroma chromatographs showed that the volatile substances in ham, in correlation with the evaluation of the aroma, can be related to the same classes as in the roast meat; the majority of which are carbonyl compounds. The presence of identical volatile compounds correlating with the sensory evaluation

of the ham aroma and roast meat aroma served as an impetus to determine the dependence of the evaluation of the aroma of heat-processed ham on the content of the volatile substances in raw longissimus dorsi muscle. The raw pork was found to contain a considerable number of volatile substances; a close correlation coeff. of ham aroma was proved for some components of the volatile fractions of raw meat. STI

88

Study into some relationships between sensoric and physicochemical properties. [Lecture] Heidemann, F. H.; Wismer-Pedersen, J. *Proceedings of the European Meeting of Meat Research Workers* No. 23, F1:1-F1:11 (1977) [2 ref. En, Ru] [Dep. of Meat Tech., Royal Vet. & Agric. Univ., Copenhagen, Denmark]

There are quantitative differences in the contents of volatile substances in cooked, fresh and cured bacon. Samples of bacon of different quality were subjected to organoleptic tests, which were combined with gas chromatographic analysis, and correlations were calculated for several constituents occurring in concn. higher than the threshold aroma. The correlation coeff. was 0.9 for good quality bacon but lower for poorer quality bacon. S compounds formed from the S-containing amino acids considerably influenced flavour and aroma. The quantity of disulphides was high in cured bacon. Organoleptic tests indicated that addition of cysteine to brine in quantities of 50 mg/l. produced an acceptable flavour, the NaNO_2 content increasing by only 0.01%. [See FSTA (1978) 10 8S1048.] STI

89

A study on the production of odoriferous products from cassie flowers (*Acacia farnesiana*).

El-Gindy, M. M.; Higazy, S.; Lotfy, M. *Egyptian Journal of Food Science* 2 (2) 141-153 (1974 publ. 1975) [16 ref. En, ar] [Food Tech. Dep., Fac. of Agric., Cairo Univ., Cairo, Egypt]

Concrete and absolute were prepared from cassie flowers picked at 3 stages of maturity: starting to bloom, half-blooming and full-blooming. Preparation of concrete and absolute involved extraction either with hexane or with hot tallow and lard (full-blooming flowers only). Studies were made of yield of flowers during the blooming period, seasonal variations in the yields of concrete and absolute, and the effect of the following factors on yields of concrete and absolute: extraction time, time of picking the flowers (7 a.m. or 12 noon), lard/tallow ratio during extraction, use of fresh, frozen or ground flowers, and blooming stage. Results are detailed in tables. Full-blooming flowers gave the best quality concrete and absolute. JA

90

[New methods for the evaluation and the analysis of organoleptic qualities of foodstuffs and for the forecast of their changes. XI. On the theory of the

dependence of the smell perception values of volatile acids and bases in aqueous solutions on their concentrations and pH values and the elaboration of quantitative analytical procedure using 'subjective olfactometry'.] Neue Methoden der Be- und Auswertung sensorischer Eigenschaften von Lebensmitteln und der Berechnung ihrer Veränderungen. II. Mitt. Zur Theorie der Abhängigkeit der Geruchsempfindungsgrößen flüchtiger Säuren und Basen in wässrigen Lösungen von ihren Konzentrationen und vom pH-Wert sowie Ableitungen quantitativer Analysenverfahren mit Hilfe der 'Subjektiven Olfaktometrie'. Herrmann, J.

Nahrung 21 (10) 873-891 (1977) [27 ref. De, en, ru] [Humboldt-Univ. Berlin, Bereich Mikrobiologie & Biochemie, Berlin (GDR)]

The relation of the intensity of aroma of volatile acids and bases to their concn., vapour pressure and the pH value of the food is considered. Titration against a sensory threshold value permits quantification of an unknown substance. This method may be applied to evaluation of changes in the organoleptic properties of foods. [See FSTA (1977) 9 6H991 for part X.] IN

91

[Genuine aroma substances of the cherry (*Cerasus avium*), and their fate from the fruit to the distillate.] Die genuinen Aromastoffe von *Cerasus avium* und ihr Schicksal von der Frucht bis zum Destillat.

Tuttas, R.; Beye, F.

Branntweinwirtschaft 117 (19) 349-355 (1977) [35 ref. De] [Inst. für Pharmazeutische Biol., Albert-Ludwigs-Univ., Freiburg im Breisgau, Federal Republic of Germany]

Aroma compounds were determined by GLC in aroma concentrates of unripe cherries, ripe cherries, cherry mashes at various stages of fermentation, cherry mashes contaminated with undesirable microorganisms, and cherry distillates. Tables and block diagrams of results and chromatograms are given. The relative significance of aroma compounds from cherries, compounds formed during fermentation and compounds formed during distillation is discussed in relation to the composition of the distilled product. Genuineness of the distilled product may be evaluated on the basis of the ratios of fermentation products, and the presence of the cherry-specific aroma compounds cinnamyl alcohol, ethyl formate, β -phenylethyl formate and dodecyl acetate. Criteria for detection of adulteration with sugar, other fruit mashes and rectified spirit are discussed, together with detection of distillation of mashes contaminated with undesirable organisms. AJDW

92

[Effect of fruktavamorin G10x on the composition of volatile compounds in alcohol.]

Kuts, A. M.; Sukhodol, V. F.; Pochikaeva, N. N.;

avchelyuk, I. D.; Borovskii, V. V.; Yarmolenko, N.; Bachurin, P. Ya.

Smerennaya i Spirtovaya Promyshlennost' No. 8, 1-23 (1977) [Ru] [KTIPP, USSR]

The effect of fruktavamorin G10x, a commercial enzyme preparation, on the yield and composition of volatile compounds in alcohol during fermentation of molasses containing 0.40, 1.06 or 1.5% raffinose was studied. Ethanol, biomass, unfermented sugar, volatile N substances, unsaturated compounds, aldehydes, higher alcohols, volatile acids, and ester contents, pH and titrimetric acidity were determined in ripened mashes and their distillates. It was established that high raffinose content in molasses and addition of fruktavamorin resulted in a high yield of alcohol. The addition of the preparation reduced the volatile acids content by 10.2-36.7%, attributable to the acids in the Krebs cycle. STI

93

Effect of selected oil and essence volatile components on flavor quality of pumpout orange juice.

Ahmed, E. M.; Dennison, R. A.; Shaw, P. E.
Journal of Agricultural and Food Chemistry 26 (2) 368-372 (1978) [27 ref. En] [Dep. of Food Sci. & Human Nutr., Univ. of Florida, Gainesville, Florida 32611, USA]

13 selected volatile orange oil and essence components were added to pumpout juice in various combinations at concn. similar to those found in orange juice. Flavour quality of the modified pumpout juice was determined by 3 types of sensory panels: trained, expert, and untrained. Pumpout juice containing a mixture of acetaldehyde, citral, ethyl butyrate, d-limonene, and octanal received the highest score by the 3 types of sensory panel used. AS

94

The isolation and fractionation of volatile flavor constituents of roasted peanuts.

Wu, C.-M.
Dissertation Abstracts International, B 38 (2) 575-576: Order No. 77-17577, 128pp. (1977) [En] [Rutgers Univ., New Brunswick, New Jersey 08903, USA]

3 methods were investigated for the isolation of volatile flavour constituents from roasted peanuts, with a view to enhancing the flavour of peanut products. An adsorption-desorption method using activated C as adsorbent was tried, but satisfactory desorption was not achieved by vacuum deodorization, distillation and Soxhlet extraction, solvent elution, Freon 21 elution, oil elution and extraction, and Neobee M-5 elution. Adsorption onto lactose, sucrose, syrup, honey, defatted roasted peanuts, vegetable oils and roasted peanut pellets was investigated. All these materials can be added directly to peanut products; sugar syrup and defatted roasted peanuts effectively adsorbed volatile flavour constituents. A method of low-

temp. entrapment of flavour constituents was the most effective for the production of an isolate to be added to peanut products. High pressure liquid chromatography and gas chromatography were used to fractionate isolated flavour volatiles, but desirable and objectionable components could not easily be separated. Carbonyl compounds were not primary flavour contributors; low b.p. S compounds were undesirable components. Volatile flavour constituents from roasted peanuts, ground peanuts and peanut butter were compared; differences were quantitative not qualitative. DIH

95

Identification of some flavor constituents of chironja.

Diaz, N.

Journal of Agriculture of the University of Puerto Rico 61 (1) 113-114 (1977) [5 ref. En]

Flavour components were separated from the essential oils of chironjas (citrus fruit) by gas chromatography (GC) in 2 steps. The flavour components were separated first on a column packed with 20% SE-30 on 60-80 mesh Chromosorb W. 24 fractions were collected and further separated by GC on 10% DEGS column. Some of the fractions were resolved into several individual peaks on the DEGS column. MS of 9 of the individual components resulting from the second step, identified 7 of the components as: n-octanol, d-limonene, α -elemene, β -elemene, caryophyllene, nootkatone, and methyl 9,12,15-octadecatrienoate. Tentative identification of the additional 8 components by GC comparison of their retention time showed them as: α -pinene, β -pinene, myrcene, citronellal, α -terpineol, linalool, nerol, and geraniol. Comparison of a chironjas oil chromatogram with and without each added standard was also used to tentatively identify unknown components. SP

96

Quality of cantaloupe muskmelons: variability and attributes.

Yamaguchi, M.; Hughes, D. L.; Yabumoto, K.; Jennings, W. G.

Scientia Horticulturae 6 (1) 59-70 (1977) [13 ref. En] [Dep. of Vegetable Crops, Univ. of California, Davis, California, 95616, USA]

Sensory evaluations of 2 cultivars of cantaloupe (*Cucumis melo* var. *reticulatus*) at the eating-ripeness stage indicated considerable variations in quality. Soluble solids, flesh firmness, rind resistance and volatile flavour components also varied. Mechanical devices for testing tissue texture correlated well with sensory evaluations. There was low correlation between total volatiles determined by GC and aroma. However, differences were noted in the production of volatile compounds between melons. Statistical analysis of the data indicated low correlation between eating-quality and soluble solids content. Sweetness was the most important attribute in the determination of eating quality. AS

97

A study of the mechanisms of formation of volatile odoriferous components of commercial stearic acid. Hsieh, A.-L.

Dissertation Abstracts International, B 38 (5) 2107-2108; Order No. 77-24986, 126pp. (1977) [En] [Rutgers Univ., New Brunswick, New Jersey 08903, USA]

Studies of 2 commercial stearic acids (CSA), (i) Emersol 132 and (ii) Century 1240, indicated that: (i) had better odour stability than (ii); there was no correlation between odour stability and the minor constituent content of CSA; and odour stability was well correlated with colour stability, (i) being more colour stable than (ii). When (ii) was washed repeatedly with water, a strong off-odour was perceived in the washings and the odour and odour stability of the washed acid were greatly improved; carbonyl compounds were found to be associated with the objectionable odour of CSA. Volatiles from triple-, double- and single-pressed CSA, namely (i), Emersol 120 and Emersol 110, were isolated and chromatographed. Results indicated that (i) contained less volatiles than Emersol 110. Volatiles from (i) and (ii) were isolated and chromatographed after 0, 5 and 10 wk of ageing at 50°C; the characteristic objectionable odour of CSA was found to be mainly due to the presence of n-pentadecane, believed to be formed by decarboxylation of palmitic acid (good quality CSA contain approx. 50% palmitic acid). The presence of styrene (probably originating from packaging materials) in (i) but not in (ii) might explain their different odour characteristics. JA

98

Artefact formation during the extraction of bacon volatiles in a Likens-Nickerson apparatus.

Mottram, D. S.; Puckey, D. J.

Chemistry and Industry No. 11, 385-386 (1978) [5 ref. En] [ARC Meat Res. Inst., Langford, Bristol, UK]

Bacon and salt pork were prepared from 2 sides of the same carcass. Extracts were analysed by gas chromatography and 2 large peaks with retention times of approx. 6 and 13 min were found in bacon extracts but not in pork. It would appear that these 2 artifacts are addition products from the reaction of 2-methylbut-2-ene with nitrogen oxides. As well as illustrating the necessity of using highly pure solvents in the analysis of flavour volatiles, this work emphasizes the reactivity of nitrogen oxides and indicates possible reactions involved in the formation of the characteristic flavour of bacon. AL

99

Interpretation of the sensory significance of chemical data in flavour research. I. Methods based on evaluating sensory properties of separated fractions and individual compounds. [Review]

Williams, A. A.

International Flavours and Food Additives 9 (2) 80-85 (1978) [79 ref. En] [Long Ashton Res.

Sta., Bristol, UK]

The article reviews methods, such as odour evaluation of gas chromatographic fractions, and threshold determinations, for interpreting the sensory importance of instrumental data based on assessing the properties of individual components and building up the information so as to interpret the complex flavour of a product. VJG

100

Volatile compounds in food. [Book]

Straten, S. van; Vrijer, F. de; Beauveser, J. C. de (Editor)

Ed. 4, 103 + 59pp. (1977) [En] Utrechtseweg 48, PO Box 360, Zeist, Netherlands; Central Institute for Nutrition & Food Research TNO Price f225

This book is a revised edition of the 'Lists of volatile compounds in food', the first edition being issued in 1963. This fourth edition contains all data given in the third one plus those published in the supplement issued in Oct. 1976, resulting in 103 lists of volatile compounds. Part of the data has been rearranged to increase accessibility. The book is intended primarily for aroma research workers and flavorists. It lists volatile compounds identified in food products and the relevant literature sources up to Aug. 1976. Volatiles reported to be present in a food product have been tabulated without judging the validity of identification. Compounds identified tentatively have been included. Under each product heading the references are listed first, followed by a list of the volatile compounds (under the following compound groups -hydrocarbons, alcohols, carbonyls, acids, esters, bases, S compounds) with the appropriate number of the literature reference. A 59-pp. index of compounds is included. VJG

101

Volatile compounds in food. Supplement 1. [Book]

Straten, S. van; Beauveser, J. C. de (Editor) 106pp. (1977) [En] Utrechtseweg 48, PO Box 360, Zeist, Netherlands; Central Institute for Nutrition & Food Research TNO

This first supplement to the fourth edition [see preceding abstr.] lists volatile compounds identified in food products in relevant literature sources up to Aug. 1977. The following products are mentioned in this supplement: alcoholic beverages - beer, rum, and wine; bread - white bread; dairy products and eggs - milk and milk products; fish, meat and poultry - beef (heated); fruits - arctic bramble, canned mango, papaya, raspberry and blackberry; spices and condiments - mint and sweet marjoram; vegetables - asparagus, cabbage, cauliflower, leek, and tomato; and miscellaneous - pecan and tea. VJG

102

Statistical application to flavor profile analysis and an iterative procedure for analyzing a two-way classification.

Applebaugh, G. N.

Dissertation Abstracts International, B 38 (6)
144: Order No. 77-26023, 46pp. (1977) [En]
Kansas State Univ., Manhattan, Kansas 66506,
SA]

03

Simultaneous gas-chromatographic profile analysis
of carcinogenic polycyclic aromatic compounds:
polycyclic aromatic hydrocarbons, carbazoles and
acridines/aromatic amines.

Grimmer, G.; Böhnke, H.; Naujack, K. W.
Zeitschrift für Analytische Chemie 290 (2) 147

(1978) [6 ref. En] [Biochem. Inst. für
Umweltcarcinogene, Sieker Landstrasse 19, 2070
Ahrensburg, Federal Republic of Germany]

A scheme for enrichment of carcinogenic
aromatic compounds is described diagrammatically.
Applications include smoked meat and fish, air-
polluted salad and leafy vegetables, vegetable fats
and oils. Splitless injection and FID (flame
ionization detection) or N-FID detection result in a
100% signal for 20 ng benzopyrene, benzocarbazole
and benzoacridines if max. sensitivity is used.
Detection limit is about 0.4 ng benzopyrene, and
the coeff. of variation for 10 analyses is 2.9-5.8%.
RM

104

Flavour from crystal malt.

Jackson, S. W.; Hudson, J. R.

Journal of the Institute of Brewing 84 (1) 34-40
(1978) [52 ref. En] [Brewing Res. Foundation,
Nutfield, Surrey, UK]

Beers brewed from grists containing between 3%
and 30% of crystal malt were examined in order to
identify the volatile substances contributing to the
characteristic flavour. Several O, N and S
heterocyclic compounds together with certain fusel
oil components are present at higher levels in beers
brewed with crystal malt than in controls brewed
with all-ale malt grist. Some of these compounds
have also been isolated from the malt itself and
from heat-treated model systems. The results are
consistent with these compounds being derived
from sugars and amino acids via Amadori
rearrangement products. AS

105

[An international system for beer aroma and
flavour terminology.]

Clapperton, J. F.; Dalglish, C. E.; Meilgaard, M.
C.

Voedingsmiddelentechnologie 10 (24) 10-15
(1977) [21 ref. Nl] [Brewing Ind. Foundation,
Nutfield, UK]

A brief account is given of an international
scheme for beer aroma and flavour terminology,
proposed by the Flavour Terminology Working
Group of the European Brewery Convention. 40
basic terms are used, many of which are subdivided
for greater specificity. Various examples of the

terms and their meanings are discussed in detail.
The importance of reference standards is also
briefly considered. AJDW

106

[Influence of preclarification of musts and of
sulphite treatment on content of volatile substances
of wines and brandies. I. Wines.]

Bertrand, A.; Marly-Brugerolle, C.; Sarre, C.

Connaissance de la Vigne et du Vin 12 (1) 35-48
(1978) [13 ref. Fr, en, de, es, it] [Inst.

d'Oenologie, Univ. de Bordeaux II, 351, Cours de
la Liberation, 33405 Talence, France]

Must of white Ugni grapes from Charentes was
treated by preclarification and (i) addition of 5 g/hl
SO₂; (ii) addition of 10 g/hl SO₂; (iii) addition of 5
g/hl SO₂ + 2 g/hl pectolytic enzymes ((i)-(iii) at
ambient temp.); (iv) no addition; or (v) addition of 5
g/hl SO₂ ((iv)-(v) at 0°C). The control (vi) was
untreated. After 20 h sedimentation, and
fermentation at 16-20°C for varying periods ((vi)
12 days; (i), (iii), (iv), (v) 15-18 days, (ii) >32 days),
the wines were left for 15 days, and then analysed
by gas chromatography with ionization flame
detector for alcoholic titre ((i)-(iii) 7.8%, (iv)-(v) 7.5-
7.6% vs. (vi) 8%), and for alcohols, esters and
polyols. In comparison with the control, all other
samples showed 40% lower concn. of polyols and
higher alcohols except 1-propanol, the latter being
present in similar quantities in all (12-16 mg/l.),
and greater concn. of esters, especially acetates of 3-
methyl-butyl and of 2-phenyl-ethyl (both at concn.
50% higher than those of (vi)). (ii) showed 13%
increase in content of esters of high mol. wt. The
organoleptic qualities of wines made from
preclarified must would show a consequent
improvement. KME

107

Production of volatiles by degradation of lipids
during manufacture of black tea.

Selvendran, R. R.; Reynolds, J.; Galliard, T.

Phytochemistry 17 (2) 233-236 (1978) [15 ref.
En] [Agric. Res. Council, Food Res. Inst., Colney
Lane, Norwich, NR4 7UA, UK]

During manufacture of black tea, lipids are
degraded to volatile constituents. Cis-3-hexenal was
present in appreciable amounts in the various parts
of fresh shoots and decreased in the second leaves
during manufacture. There was a simultaneous
increase in trans-2-hexenal. Linalool and methyl
salicylate also increased appreciably during rolling
and fermentation. Most of the volatiles were lost
during the firing process. The above trend was
borne out by the potential of the leaves for the
production of volatiles as indicated by the increased
amounts of volatiles produced by homogenizing the
tissue in water against controls homogenized in 0.1
N acid. The C₆-aldehydes present in the headspace
of withered shoots increased significantly following
mechanical damage. The major fatty acids of the
lipids in the various parts of the shoots were
linoleic, linolenic, palmitic, oleic and stearic acids.

The ratio of linoleic to linolenic acid in the stems was much higher than that of the leaves or buds and this was reflected in its higher potential for formation of hexanal. During withering and rolling of the second leaves, unsaturated fatty acids showed substantial losses compared with the saturated acids. It is suggested that the enzymic breakdown of membrane lipids initiate the formation of volatile carbonyl compounds which are partly responsible for the flavour of black tea. AS

108

Volatile constituents of jack fruit (*Artocarpus heterophyllus*).

Swords, G.; Bobbio, P. A.; Hunter, G. L. K.

Journal of Food Science 43 (2) 639-640 (1978)

[2 ref. En] [Corporate Res. & Development Dep., Coca-Cola Co., PO Drawer 1734, Atlanta, Georgia 30301, USA]

Using a combination of gas chromatography and MS, 20 major components from an extract of distillate from jack fruit were identified. Of these, 16 were esters and 4 were aliphatic alcohols. The total absence of terpenoids in jack fruit is unique in the plant kingdom. IFT

109

Volatile monocarbonyl compounds of carrot roots at various stages of maturity.

Linko, R. R.; Kallio, H.; Pyysalo, T.; Rainio, K.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 166 (4) 208-211 (1978) [26 ref. En, de] [Dep. of Chem. & Biochem., Univ. of Turku, SF-20 500 Turku 50, Finland]

Volatile carbonyl compounds of carrot var. Feonia Hunderup S-64 at various stages of maturity [9-14 wk old, average diam. 1.6-3.9 cm, resp.] were analysed as their 2,4-dinitrophenylhydrazones by a combined TLC-GLC-MS method. 23 different carbonyl compounds were identified, of which undecanal, buten-2-al, methylbutenal, pentan-2-one, 6-methyl-5-hepten-2-one and 5-methylfurfural have not previously been found in carrot. During maturation the content of acetaldehyde and acetone increased significantly (from 2.6 and 0.1 mg/kg fresh wt., resp., to 16.9 and 0.8), while that of methylbutenal decreased from 2.6 to 0.7 mg/kg fresh wt. AS

110

Studies on the volatile components of rice and rice bran. II. Volatile components in the steam distillate of rice bran: identification of neutral and basic compounds.

Tsugita, T.; Kurata, T.; Fujimaki, M.

Agricultural and Biological Chemistry 42 (3) 643-651 (1978) [23 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Tokyo, Japan]

Neutral and basic fractions obtained from the volatile concentrate of rice bran were analysed by glass capillary gas chromatography. N- or S-containing compounds in the basic fraction were

detected with a flame thermionic detector or a flame photometric detector. A total of 146 compounds (alkanes, aromatic hydrocarbons, alcohols, aldehydes, ketones, esters, lactones, furans, pyridines, pyrazines, quinolines, thiazoles, thiophenes, etc.), in addition to the 7 phenols and 17 acids reported in part I [see FSTA (1978) 10 3M304], was newly identified in the neutral and basic fractions from the volatile concentrate of rice bran. 2-acetylthiazole and benzothiazole in the concentrate were considered to be the key compounds of rice bran odour, and other compounds, e.g. lactones, were also thought to be necessary for reproduction of the odour. AS

111

Quantitative analysis of volatiles in milk products by capillary gas chromatography.

Palo, V.; Hrivnak, J.

Milchwissenschaft 33 (5) 285-287 (1978) [3 ref. En, de] [Slovak Tech. Univ., Bratislava, Czechoslovakia]

Volatile compounds are extracted from 300 ml milk at 50°C with a stream of N flowing at a rate of 1 ml/min, and condensed in a capillary pre-column held in a cooling bath at -60°C. The capillary pre-column is then connected to the gas chromatography analytical capillary column by a 'split less' injection technique (described in detail). For analysis of milk fat, 30 ml liquid fat at 45°C are poured into a glass tube filled with Chromosorb W and the volatile compounds are extracted with N at 70°C for 10 min. Calibration curves for methanol, acetone, isopropanol and sec-butanol are given for the concn. range 0.1-3.0 p.p.m. A chromatogram of volatiles from 30 ml fat from Bryndza ewes' milk cheese indicated that isopropanol was the main volatile constituent, followed by n-propanol and lower amounts of isobutanol, n-butanol, sec-butanol, methanol, 2-butanone and acetone. MEG

112

Methods of making objective the results of sensory analysis of dairy products.

Sadini, V.

XX International Dairy Congress E, 433 (1978) [6 ref. En] [Chem. Inst., Univ. of Padua, Padua, Italy]

Study of the relationship between results of sensory examination and chemical analysis (GLC + MS) for volatile compounds separated from cheese did not yield conclusions of practical significance for making organoleptic assessment more objective. Further studies are being made with predictive computer models. [See FSTA (1978) 10 10P1408.] ADL

113

[Determination of free volatile fatty acids in major cheese varieties made in Brazil.]

Bonassi, I. A.

Technique Laitiere No. 921, 39-41 (1978) [15 ref. Fr] [Fac. des Sci. Agron., Campus de

lotucatu, 18600 SP, Brazil]

Samples of different cheese varieties (Minas, Prato-Lunch, Estepe, Reino, Provolone and Parmesan), accounting for about 75% of all the cheeses manufactured in Brazil, were analysed chromatographically for free volatile fatty acids. The results are tabulated for 12 samples, giving values for acetic, propionic + isobutyric, butyric, isovaleric and caproic acids, together with flavour grade and mostly also with DM and fat in DM contents. All the varieties were generally high in butyric and acetic acids (particularly Provolone, Estepe and Minas); caproic acid was present in all cheeses analysed, highest amounts being found in Minas, some Prato-Lunch, Estepe and some Parmesan. FL

114

Volatile amines in the aroma of milk protein concentrates.

Obelets, V. A.; Rostrosa, N. K.; D'yachenko, P. F. *XX International Dairy Congress E*, 286-287 (1978) [En] [Moscow Tech. Inst. of Meat & Dairy Ind., Moscow, USSR]

Composition of the volatile organic bases of casein and coprecipitate aroma condensate after storage of samples for 3-12 months was analysed by GLC and identified using a computer. During storage, amines, mainly heterocyclic (pyridene, 2,3,5-trimethylpyrazine and 2,3,5,6-tetramethylpyrazine), accumulated; their presence correlated well with the deterioration in the organoleptic properties and the intensification of the musty odour in casein and coprecipitate. [See FSTA (1978) 10 10P1408.] DMK

115

Volatile components of "Chanakh" pickled cheese. Dilanyan, Z. Kh.; Magak'yan, D. T. *XX International Dairy Congress E*, 295-296 (1978) [2 ref. En] [Zootech.-Vet. Inst., Erevan, USSR]

In 2-month-old Chanakh pickled cheese there was 118.1 mg% of the C1-C4 volatile fatty acids (VFA), principally acetic acid. Similar ratios of VFA were found in the pickling brine. 35 nitrogenous components were detected in the cheese, including particularly di-n-butylamine, pyridine and trimethylamine. [See FSTA (1978) 10 10P1408.] JMD

116

Effects of storage and polyphosphates on the flavor volatiles of canned poultry meat.

Rao, C. S.; Day, E. J.; Chen, T. C. *Journal of Food Science* 43 (2) 515-516 (1978) [9 ref. En] [MAFES, Poultry Sci. Dep., Mississippi State Univ., Mississippi 39762, USA]

The effects of storage and polyphosphates on the volatile components of canned broiler meat were investigated. The concn. of H_2S , methyl mercaptan, and saturated and total carbonyls of both control and polyphosphate-treated broiler meat increased

slightly upon storage. A greater increase in unsaturated carbonyls was observed for the controls than for the polyphosphate-treated samples. During storage, the general trend of increasing thiobarbituric acid (TBA) values was not affected by the presence of polyphosphates; however, the control samples had the highest TBA values throughout the observation period. All canned samples exhibited a continued increase in free NH_3 content as the storage time advanced. Polyphosphates also retarded the formation of free NH_3 in canned broiler meat during storage as compared to controls. IFT

117

[Test methods for vegetable and animal fats and oils. Determination of the content of volatile constituents, including water.]

Netherlands, Nederlands Normalisatie-Instituut *Netherlands Standard NEN 6325*, 2pp. (1977) [Nl] [Polakweg 5, Rijswijk, Netherlands]

2 procedures are described for detn. of the content of volatile matter (including water) in fats and oils: a system based on heating the sample on a sand bath, and a system based on oven-heating. In both methods, the oil or fat is heated at approx. 103°C until volatiles and water are driven off; the remaining material is weighed and the wt. loss attributable to evaporation of volatile matter may be evaluated. Replicate analyses should differ by $\leq 0.05\%$. The oven method is not suitable for fats with a volatile matter content $> 3\%$ or an acid value > 4 , or for drying oils, coconut oil or palm kernel oil. AJDW

118

Analysis of flavor quality and residual solvent of soy protein products.

Rayner, E. T.; Wadsworth, J. I.; Legendre, M. G.; Dupuy, H. P.

Journal of the American Oil Chemists' Society 55 (5) 454-458 (1978) [9 ref. En] [Southern Regional Res. Cent., USDA, PO Box 19687, New Orleans, Louisiana 70179, USA]

A simple, direct, gas chromatographic technique is described for eluting and resolving residual solvent and flavour-related volatile components from soy products such as flour and protein isolates. No prior enrichment of volatiles is necessary. A sample, together with a small amount of water, is secured in a glass liner and placed in the heated injection port of a gas chromatograph. The volatiles are rapidly steam distilled from the sample by the heat, moisture, and flow of carrier gas and are adsorbed on the chromatographic column in situ. Residual solvent and other volatiles adsorbed on the column are resolved by temp.-programmed gas chromatography and identified by combined gas chromatography-MS. The correlation between taste panel flavour score and concn. of volatile components is significant at the 1% level. AS

119

Examination of fermented cider volatiles following concentration on the porous polymer Porapak Q. Williams, A. A.; May, H. V.; Lucknott, O. G. *Journal of the Institute of Brewing* 84 (2) 97-100 (1978) [25 ref. En] [Cider & Fruit Juices Sect., Long Ashton Res. Sta., Bristol, UK]

The volatiles in the air above cider were collected on Porapak Q, regenerated and examined by capillary column gas chromatography and gas chromatography-MS. The composition of the extract differs from that obtained from distillation and extraction techniques giving increased relative concn. of non-polar components. 105 peaks were detected and 59 components identified. Several of these have not previously been reported in ciders. AS

120

Studies of volatile components in the dichloromethane extracts of Australian flor sherries: the identification of the isomeric ethylidene glycerols.

Williams, P. J.; Strauss, C. R.

Journal of the Institute of Brewing 84 (3) 144-147 (1978) [20 ref. En] [Australian Wine Res. Inst., Glen Osmond, S. Australia, 5064]

The dichloromethane extract from Australian flor sherries was found on analysis by GLC-MS to be rich in hydrophilic and polar compounds, including the isomeric ethylidene glycerols. Comparison of these extracts with those obtained from typical base wines from which such flor sherries are prepared did not reveal differences which could help to explain the characteristic aroma brought about by the flor process. The structure and stereochemistry of the 4 GLC-separated ethylidene glycerols were determined. AS

121

The influence of film yeast activity on the aroma volatile of flor sherries - study of volatiles isolated by headspace sampling.

Williams, P. J.; Strauss, C. R.

Journal of the Institute of Brewing 84 (3) 148-152 (1978) [23 ref. En] [Australian Wine Res. Inst., Glen Osmond, S. Australia, 5064]

Headspace analyses of Australian flor sherries showed that the aroma-significant components were ethyl esters of n-hexanoic, n-octanoic and n-decanoic acids as well as n-hexanol. After varying periods of flor film growth, changes in the composition of aroma substances occurred. A decrease with time in concn. of ethyl n-octanoate and ethyl n-decanoate was accompanied by an increase in the concn. of 2-phenethyl alcohol and diethyl succinate whilst the concn. of n-hexanol was unaffected. [See also preceding abstr.] AS

122

[Determination of aroma substances in Spalter hops by gaschromatography - mass spectrometry.] Gaschromatographisch-massenpektrometrische

Untersuchung der Aromastoffe von Spalter Hopfen

Fressl, R.; Friese, L.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 166 (6) 350-354 (1978) [14 ref. De, en] [Lehrstuhl für Chemisch-Techn. Analyse, Tech. Univ., Berlin (West)]

The volatiles of Spalter hops were concentrated by distillation-extraction, separated by liquid-solid chromatography and characterized by capillary gas chromatography-MS. 125 constituents (terpenes, sesquiterpenes, esters, alcohols, acids) were identified and semiquantified. AS

123

[Flavour components of rum.] [Review]

Nemoto, S.; Miyamoto, K.; Usui, T.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 73 (1) 35-41 (1978) [37 ref. Ja] [Godo Shusei Co., Ltd., Ushiku, Ibaragi, Japan]

The rum flavour components covered in this review include alcohols, acids, esters, carbonyl compounds, phenols, and ethers. YN

124

[Volatile nitrogen bases of sherry-type wine.]

Kishkovskii, Z. N.; Enikeeva, N. G.; Dremucheva, G. F.; Golovnya, R. V.; Zhuravleva, I. L.

Prikladnaya Biokhimiya i Mikrobiologiya 13 (5) 773-778 (1977) [14 ref. Ru, en] [Moscow Tech. Inst. of Food Ind., Moscow, USSR]

The composition of N bases isolated from sherry-type wine by vacuum distillation was studied. > 50 compounds were detected by GLC, of which 37 compounds were identified, including primary, secondary and tertiary aliphatic amines, pyridine and piperidine bases. Chemical composition of the wine studied is tabulated. AS

125

[Quantitative composition of natural and technologically modified plant aromas. V. Influence of HTST-heating on the constituents of apple juice.] Über die quantitative Zusammensetzung natürlicher und technologisch veränderter pflanzlicher Aromen. V. Über den Einfluss der Maische-Hochkurzzeiterhitzung auf die Inhaltsstoffe von Apfelsaft.

Schreier, P.; Drawert, F.; Mick, W.

Lebensmittel-Wissenschaft und -Technologie 11 (3) 116-121 (1978) [31 ref. De, en] [Inst. für Lebensmitteltech. & Analytische Chemie, TU München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

Comparative studies were carried out in order to determine the quantitative composition of flavour compounds in apples (Jonathan) and the influence of HTST-heating on non-volatile (total polyphenols, leucoanthocyanins) as well as on volatile constituents of apple juices. The involvement of HTST-heating during juice processing leads to a reduction of < 80% of secondary

flavour compounds formed otherwise under conventional processing conditions (without enzyme inhibition) because of the destruction of the cells. In comparison to conventionally produced juices HTST-heated products contain more natural fruit esters and phenolic compounds. The influence of holding time of the juice until pasteurization on the constituents of the differently treated products was also investigated. The non HTST-heated juices showed the highest modifications. [See FSTA (1978) 10 1H154 for part IV and 10 7H881 for part III.] AS

126

Utilization of oleuropein by microorganisms associated with olive fermentation.

Garrido-Fernandez, A.; Vaughn, R. H.

Canadian Journal of Microbiology 24 (6) 680-684 (1978) [28 ref. En, fr] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California, 95616, USA]

The utilization of oleuropein, the bitter glucoside of olives whose hydrolysis products can possess antibacterial action, as a major source of carbon by microorganisms was assessed. Various microorganisms associated with fermentation of olives (both desirable lactic acid bacteria and spoilage organisms) were able to grow on the media, Bacto yeast nitrogen medium with or without 1% glucose, containing 0.2 or 0.4% oleuropein, and many without a significant delay in growth resulting in the appearance of a strong visible turbidity. Although the increase in oleuropein from 0.2 to 0.4% (w/v) had little or no effect on the spoilage organisms, the additional glucoside caused a delay in development of growth with some lactic acid bacteria. It was concluded that the glucoside was not inhibitory to spoilage organisms, but that perhaps the glucose moiety of the glucoside is the limiting factor for development of strong turbidity in some cultures. It was also thought that the degradation of the compound contributes to the accumulation of acids and flavouring compounds of fermented green olives, as well as the typical residual bitterness associated with such olives. SP

127

[Quantitative and qualitative analysis of aroma compounds in apples and apple products.]

Kaack, K.

Tidsskrift for Planteavl 81 (2) 139-147 (1977) [7 ref. Da, en] [Statens Forsogssta., Blangstedgaard, 5220 Odense, Denmark]

A headspace GLC method (using a UCON LB-550-x/diatomite C column and flame ionization detection) for detn. of aroma compounds in apples and apples products is described. Aroma substances are identified on the basis of their retention times, and, in some cases, their smell; quantitative detn. is based on the use of 2-methyl-1-butanol as an internal standard. Applications of the procedure are discussed, with reference to tables showing corrected and non-corrected R_f values for various aroma compounds; results of sniff analysis of aroma

substances in Cox's Orange Pippin apples; concn. of important aroma compounds in Spartan, Golden Delicious, Mutsu and Cortland var. apples; effects of harvesting date on aroma compound concn. in Ingrid Marie apples; and effects of processing method on aroma compound concn. in apple juice. AJDW

128

Variations in the volatile components of yoghurt.

Kondratenko, M. S.; G'osheva, B.

XX International Dairy Congress E, 297-298

(1978) [En] [TsEPL, DSO 'Mlechna

Promishlenost', Sofia, Bulgaria]

Volatile substances responsible for aroma of yoghurt appeared to be acetaldehyde, acetone, 2-butanol and ethanol that were present in very small quantities in pasteurized milk, and ethyl acetate and diacetyl that appeared after inoculation. Acetaldehyde, diacetyl and ethyl acetate increased during culture at 45°C then decreased during storage at 4°C, whereas ethanol increased after the 10th day of storage. [See FSTA (1978) 10 10P1408.] CDP

129

The possible use of lac^- starter strains to accelerate cheese ripening and a method for their detection in cheese.

Dulley, J. R.; Brooks, D. E. J.; Grieve, P. A.

XX International Dairy Congress E, 485-486

(1978) [4 ref. En] [Otto Madsen Dairy Res. Lab., Hamilton, Australia]

Cultures of lac^- mutants of *Streptococcus lactis* strain C2 were added to the cheese vat with *Str. cremoris* strain E8 as starter. Increase in lac^- C2 count was much slower during cheesemaking than the increase in E8 count. Addition of the lac^- mutant resulted in some accelerated ripening and less bitterness development than in control cheeses. [See FSTA (1978) 10 10P1408.] DMK

130

[Consistency and flavour in low-fat rennet cheese.]

Nes, A. M.

Meieriposten 67 (13) 398-400 (1978) [No]

[Meierinst., NLH, Vollebakk, Norway]

Results are reported of cheesemaking experiments which have been carried out in the past few years at the Department of the Dairy Industry, Agricultural College of Norway. They indicate that the consistency of cheese with low fat content (e.g. 10 or 20% fat in DM) can be improved by paying attention to certain factors in the cheesemaking process. Effects of the following factors on Norvegia cheese consistency and flavour are examined in detail, in the light of the experiments: addition of 6% whey protein concentrate to cheese milk; cooking the curd at lower than normal temp. (35°C gave good flavour and consistency, but 32° and 38°C were less satisfactory); renneting temp. (consistency was best if rennet was added at 36°C

rather than 33° or 30°C, and if the temp. was then allowed to fall to 33°C before stirring); and ripening conditions (smear-ripened cheese had particularly good flavour and consistency). ADL

131

An analysis of some flavours of Emmental cheese. Biede, S. L.; Hammond, E. G.

XX International Dairy Congress E, 294-295 (1978) [En] [Dep. of Food Tech., Iowa State Univ., Ames, Iowa 50010, USA]

7 Emmental cheeses with a range of flavours were fractionated to yield 3 flavour-bearing fractions. 9 flavours in the cheese and fractions were assessed subjectively. The water-soluble volatile fraction contained fatty acids, diacetyl and ammonia. The water-soluble, non-volatile fraction had a wide range of flavours from the peptides, amino acids and lactic acid it contained; Ca and Mg affected the flavour of the peptides. The fat-soluble fraction contained fatty acids, carbonyls, pyrazines and lactones. [See FSTA (1978) 10 10P1408.] JMD

132

Determination of volatile fatty acids in dilute aqueous solution by gas chromatography. Analysis of dairy products.

Brathen, G.

XX International Dairy Congress E, 372-373 (1978) [En] [Meierilab., Oslo, Norway]

Since the aqueous samples injected into the gas chromatograph contained a high concn. of non-volatiles, frequent changes of a glass liner in the injection port prevented accumulation of non-volatiles and thereby the possibility of extraneous peaks and loss of samples. Use of HPO_3 in the sample, addition of H_3PO_4 to the stationary phase, and small-injection vol. resulted in sharp peaks and no tailing. Coeff. of variation for the acids were 0.24-1.58%. Effective detection limit was approx. $0.2 \mu\text{g}/100 \text{ ml}$ samples. [See FSTA (1978) 10 10P1408.] DMK

133

Behaviour of sulphhydryl and disulphide groups in milk and milk proteins.

Burki, C.; Blanc, B.

XX International Dairy Congress E, 287-288 (1978) [4 ref. En] [Swiss Fed. Dairy Res. Sta., Liebefeld, Bern, Switzerland]

In fresh and reconstituted milk, milk fractions and whey proteins, free SH groups increased at first during heat treatment (reaching a max. after 10 min at 90°C), then decreased. Total SH groups and SH + SS groups decreased during heat treatment. During storage there were decreases in SH groups and also in volatile S compounds. The characteristic early flavour of UHT milk appeared linked to the latter. [See FSTA (1978) 10 10P1408.] ADL

134

Lactone flavour components of ghee.

Wadhwa, B.; Bindal, M. P.; Jain, M. K.

XX International Dairy Congress E, 890-891 (1978) [1 ref. En] [Nat. Dairy Res. Inst., Karnal, India]

Lactones were identified and determined in ghee made by 3 methods each at 4 clarification temp. The γ -lactones were present at higher concn. in ghee made at 110° and 120°C, but lower if made at 140° or 160°C, than in ghee made by direct cream or creamery butter methods. These changes affected the ratio of γ/δ -lactones. C5, C10 and C12 were the main γ -lactones and C10 and C12 the main δ -lactones. [See FSTA (1978) 10 10P1408.] JMD

135

Application of mixed starters in the production of Trappist cheese.

Obradovic, D.

XX International Dairy Congress E, 572 (1978) [2 ref. En] [Dairy Inst., Novi Beograd, Yugoslavia]

Trappist cheese made with a *Micrococcus* M104/*Streptococcus lactis* Ak-60 mixed starter had butyric, caproic and acetic acid contents of 2.5, 2.4 and 2.1 mg/100 g DM resp. at the beginning of ripening, and 5.4, 3.7 and 7.4 mg/100 g DM after 4 wk ripening. Total bacterial count developed normally and micrococci decreased during the 1st 10 days then increased again. The cheese had a normal flavour. [See FSTA (1978) 10 10P1408.] CDP

136

Cultural characteristics of *Leuconostoc* strains from cheese starters.

Pearce, L. E.; Halligan, A. C.

XX International Dairy Congress E, 520-521 (1978) [2 ref. En] [New Zealand Dairy Res. Inst., Palmerston North, New Zealand]

Leuconostoc strains with varying ability to ferment lactose had optimum growth temp. of 29-30°C in yeast/glucose/litmus milk, and gave max. cell mass at pH 5.2. Although they appeared to contribute to Cheddar cheese flavour during the 1st 14 days after manufacture, they had no significant effect on the flavour of the mature cheese. [See FSTA (1978) 10 10P1408.] CDP

137

Characterization of lactic streptococci in connection with cheese bitterness.

Choisy, C.; Lenoir, J.; Tourneur, C.; Gueguen, M.; Juras, M.; Rivault, D.

XX International Dairy Congress E, 492-493 (1978) [3 ref. En] [Lab. de Tech., Inst. Nat. Agron. Paris-Grignon, Thiverval-Grignon, France]

Bitter strains of lactic streptococci had a higher multiplication rate, higher proteolytic activity and

ver proline-iminopeptidase activity than non-fer strains. Values for these 3 properties were combined into an index that may prove of use for finding starter strains. [See FSTA (1978) 10 P1408.] JMD

38

[Sulphur compounds in milk and cheese.]

Alencar, H. C.; Soares, C. H. L.; Akahoshi, M. R. *Boletim do Instituto de Tecnologia de Alimentos* (1) 279-296 (1977) [4 ref. Pt, en]

Results are tabulated of detn. of SH compounds in various types of cheese (Prato, Parmesan, Minas, Ricotta, processed, Musarella, Chandriche, Roquefort, Provolone, Swiss, Estepe) both on the day of purchase and after storage for 24-48 h at 4 or 20°C. It was found inter alia that cheeses of little flavour, such as Prato, contained no SH groups. When milk was heated at 80-90°C, its content of SH groups increased with increasing temp., from about 1 mg% cysteine at 80°C to a max. of 2.38 mg% at 90°C. In 6 batches of cheese milk subjected to different heating regimes, the lowest content of SH groups was found after heating for 1 h at 37°C and the highest after heating for 30 min at 70°C. In Prato cheese manufacture, the milk with the highest SH group content gave the poorest cheese flavour, while the milk with the lowest content gave cheese with a good flavour and in which the SH groups increased from a low initial level to a max. of 11 mg% cysteine after 4 wks' ripening. Finally, experiments on the use of the cheese slurry method (*Journal of Dairy Science* (1967) 50 (3) 292-297) for processed cheese manufacture revealed that the method was practicable and that addition of glutathione to the slurry improved flavour. Owing to the strict hygiene required, however, it was concluded that the method is not suitable for industrial use in Brazil. Attempts to use the cheese slurry method for studying the ripening of Prato cheese were unsuccessful. ADL

139

[Processed cheese from goats' milk cheese.]

Fredriksen, E. B.; Steinsholt, K.

Meieriposten 67 (13) 393-395 (1978) [2 ref. No] [Meieriinst., NLH, Vollebakk, Norway]

A spreadable processed cheese with about 45% DM and 47% fat in DM was experimentally produced from goats' milk cheese, using a Kustner machine. After melting, the cheese was treated in an Omni-mixer operating at 16 000 rev/min without load. Goats' casein, goats' whey protein and 1:1 mixtures of goats' whey protein with cows' casein were added in an attempt to reduce the goats' milk flavour. These additions were varied in 3 levels (0, 5 and 10% of the final product). Two flavour additives (tomato puree and red paprika) were also tried in 3 levels. The processed cheese was generally of good quality; addition of the goats' whey protein/cows' casein mixture improved both consistency and flavour, but goats' whey protein alone had an adverse effect on consistency.

Addition of goats' casein improved consistency but had no effect on flavour. Paprika had excellent effects on consistency and flavour, but tomato puree had less effect. In Norway goats' milk is mainly used for making whey cheese, and ordinary cheese made from goats' milk has relatively poor sales owing to its variable quality. ADL

140

Thermally produced volatile basic components of egg white and ovalbumin.

Kato, Y.; Watanabe, K.; Sato, Y.

Lebensmittel-Wissenschaft und -Technologie 11 (3) 128-130 (1978) [21 ref. En] [Women's Coll. of Tokaigakuen, Hirabari, Tenpaku-ku, Nagoya 468, Japan]

The volatile basic components produced from egg white and ovalbumin heated at 120°C for 2 h at pH 10 were collected, fractionated and analysed by gas chromatography and combined gas chromatography-MS. 11 basic components were confirmed: pyridine and 2-methylpyridine, pyrazine and 6 alkyl-substituted pyrazines and 2 alkyl-substituted thiazoles. The pyrazine group was found at a higher concn. than the pyridine group in egg white and ovalbumin. However, pyridine was a main basic volatile in the latter (26.8% of basic volatiles). Thiazoles were minor components of both. It was suggested that bound carbohydrate in the ovalbumin molecule reacted to form the basic volatiles through the nonenzymic browning reaction. AS

141

[Nucleotides and volatile bases as quality indices of iced fish.]

Ohta, F.; Kikuchi, H.; Ishigami, T.

Memoirs of Faculty of Fisheries Kagoshima University 24, 173-179 (1975) [13 ref. Ja, en] [Lab. of Food Preservation, Fac. of Fisheries, Kagoshima Univ., Kagoshima, Japan]

Several species of fish landed at Kagoshima were examined for the relationship of the degree of nucleotides degradation (DND) or the amount of volatile bases (VB) in the muscle to the subjective quality of fish. The correlation of DND in fish to their organoleptic scores was highly significant, VB less so. The probability of estimating fish grade from chemical values with linear regression was larger with DND than VB. Between mackerel and bream groups of fish, there was a distinct difference in DND corresponding to quality grade. AS

142

[Studies on changes in aromatic substances of coriander during heat-drying and freeze-drying.]

Untersuchungen zur Veränderung der aromatischen Stoffe des Korianders durch Wärme- und Sublimationstrocknung.

Tschogowadse, Sch. K. [Chogovadze, Sh. K.]; Bachtadse [Bakhtadze], D. M.

Lebensmittel-Industrie 24 (11) 513-515 (1977)
[6 ref. De, en, ru] [Nat. Univ., Tbilissi, USSR]

Essential oils of (i) fresh, (ii) heat-dried and (iii) freeze-dried coriander were analysed by GLC using a Chromosorb W 60-80 column with 1,4-butanediol succinate mobile phase. Tables of results are given. Total essential oil content was highest in (i), and lowest in (ii). 37 components were detected in (i), 29 in (ii) and 31 in (iii). 6 components were identified (α -pinene, linalool, p-cymol, borneol, geraniol and decylaldehyde); concn. of all these were higher in (i) than in (ii) or (iii), and with the exception of linalool, the concn. of which was higher in (iii) than in (ii). IN

143

Analysis of neutral volatiles of mayonnaise by direct gas chromatography and mass spectrometry. Fore, S. P.; Legendre, M. G.; Fisher, G. S.

Journal of the American Oil Chemists' Society 55 (5) 482-485 (1978) [11 ref. En] [Southern Regional Res. Cent., USDA, New Orleans, Louisiana 70179, USA]

Simple procedures have been developed for analysing neutral volatiles from mayonnaise by direct gas chromatography (GC) and combined direct GC-MS. For GC analysis, a glass liner containing glass wool coated with alkali in the lower quarter and plain glass wool in the remaining space is placed in the heated inlet of a gas chromatograph, and mayonnaise and water are injected onto the plain packing. Neutral volatiles eluted from the mayonnaise by the combined action of water, carrier gas, and heat collect on the cool column of the gas chromatograph, but acetic acid is trapped by the alkaline glass wool and thus does not interfere with the analysis. After removal of the liner with the spent sample, the temp. of the column oven is programmed to resolve the volatiles for MS analysis, neutral volatiles are passed directly from a chromatograph inlet to a second inlet liner containing a porous polymer that traps most organic compounds but has low affinity for water. These neutral organic volatiles are desorbed from the porous polymer in the inlet of a chromatograph interfaced with a MS for analysis. This procedure allows components resolved by the GC to be identified by MS without interference from either water or acetic acid. A total 21 neutral volatile compounds were identified in mayonnaise, these were: methanol; acetaldehyde; ethanol; pentane; propanal; pentene; acetone; ethyl acetate; 3-methylbutanol; pentanal; 1-pentanol; hexanal; furfural; allyl isothiocyanate; trans-2-heptenal; 2-pentylfuran; trans-2, cis-4-decadienal; trans-2, trans-4-decadienal; trans-2, cis-4-heptadienal; benzaldehyde; and trans-2, trans-4-heptadienal. AS

144

Volatile retention during rehumidification of freeze dried food models.

Omatete, O. O.; King, C. J.

Journal of Food Technology 13 (4) 265-280

(1978) [31 ref. En] [Dep. of Chem. Eng., Univ. of California, Berkeley, California 94720, USA]

Observations of structural collapse during rehumidification of freeze dried substances (20% solutions of maltose, β -lactose, polyvinyl pyrrolidone, dextran or bovine serum albumin) are used to interpret previously reported data for volatiles loss vs. time. The results are in accord with a diffusion-based analysis. At low moisture contents the diffusion coeff. is so low as to give only very small losses, while at high moisture contents it is high enough to give complete loss in a relatively short time. The behaviour at intermediate moisture contents depends upon whether or not there is simultaneous structure collapse. If there is no collapse, volatiles-loss data appear to agree well with a slab-diffusion analysis based upon constant diffusivity and unchanging slab thickness - the average thickness of webs within the porous substance. When there is simultaneous collapse, it is necessary to take into account the continuous increase in web thickness as diffusion occurs. A model is derived based upon a linear increase in web thickness with increasing time, and is shown to agree with experimental data for volatiles loss at intermediate moisture contents in several different systems which show structural collapse. AS

145

Chemistry and flavour. [Conference proceedings] United Kingdom, Chemical Society
Chemical Society Reviews 7 (2) 167-218 (1978)
[En]

The full text of papers presented at a 'Chemistry and Flavour' symposium organized by the Chemical Society Food Chemistry Group, held on 19 Oct. 1977 in London, is given. 6 papers are abstracted separately in FSTA and appear in the author index under United Kingdom, Chemical Society [Chemistry and Flavour Symposium]. SP

146

The influence of flavour chemistry on consumer acceptance. [Lecture]
Swindells, R.

Chemical Society Reviews 7 (2) 212-218 (1978)
[En] [Beecham Products, Beecham House, Brentford, Middlesex TW8 9BD, UK]

The influence of flavour chemistry on consumer acceptance is discussed, covering the following topics: flavours, including fruit, sweetness, bitterness and the use of flavourings to enhance the palatability of milk; injection of flavour into inferior flavoured products, e.g. chickens; and flavours in foreign foods. [See FSTA (1978) 10 12A728.] SP

147

The influence of legislation on research in flavour chemistry. [Lecture]
Nightingale, W. H.

Chemical Society Reviews 7 (2) 195-200 (1978)
[En] [Food Ind. Ltd., Bromborough Port, Wirral, Merseyside L62 4SU, UK]

the influence of legislation on research in your chemistry is discussed, including the consequences of legislative action on commercial investment in flavour research projects, and the effects of flavour legislation on the range of food products available for consumers. [See FSTA (1978) 10 12A728.] SP

148

Vanilla and 'vanilla-flavoured' products. A new development system for thin-layer chromatograms. Bourcelles, C.; Rey, S.; Carbonel, F.; Dupont, A.; Andoorn, M.; Zeltstein, P.

Annales des Falsifications et de l'Expertise Chimique 71 (763) 121-128 (1978) [6 ref. Fr]
Lab. Central de la Repression des Fraudes, 25 avenue de la République, 91305 Massy, France]
Studies on development of a TLC method for separation of constituents of genuine vanilla and vanilla substitutes are described. A procedure is described, using silica gel F 254 plates, and a Vario-KS chamber divisible into 5 compartments. Development is conducted simultaneously with 3 solvents (chloroform/benzene 30:70; isopropyl ether/dichloromethane 3:97; and butyl acetate), in different subdivisions of the Vario-KS chamber. The strip to be developed with butyl acetate requires preconditioning with 0.15% aqueous NH_4OH before development; the strips to be developed with the other 2 solvent systems require preconditioning with 5% H_2SO_4 . Flecks are identified after treatment of the developed plate with test reagents (aqueous hydrazine sulphate solution, ethanolic KOH solution, diazotized p-nitroaniline, conc. H_2SO_4). Good separation of constituents characteristic of genuine vanilla and imitation vanilla flavours is possible. Diagrams of developed chromatograms are given for Tahiti vanilla, adulterated sweetened and non-sweetened vanilla extracts, and an artificial vanilla flavouring. AJDW

149

Retention of volatile trace components in freeze-drying model solutions.

Voilley, A.; Simatos, D.; Loncin, M.
Lebensmittel-Wissenschaft und -Technologie 10 (5) 285-289 (1977) [16 ref. En] [Ecole Nat. Supérieure de Biol., Appliquée à la Nutr. et à l'Alimentation, Campus Univ., 21000 Dijon, France]

Retention of the volatiles, acetone, 1-octanol, and octanoic acid, during freeze-drying was investigated. Several substrate constituents were used: glucose; fructose; sucrose; raffinose; citric acid; calcium chloride; dextran; pectins; and orange juice. Samples prepared from water, non-volatile substrate + volatile, were freeze-dried at 3 freezing rates: slow, $0.2^\circ\text{C}/\text{min}$; medium, $7^\circ\text{C}/\text{min}$; and rapid, $20^\circ\text{C}/\text{min}$. Residual moisture was determined by Karl Fisher titration method. The freeze-dried samples were rehydrated with distilled water. The volatile content in the sample before and after freeze-drying was determined by 2 methods:

radioactive counting and GLC. Analyses of the influence of rate of freezing, frozen storage and initial concn. of volatile on its retention after freeze-drying are given in tables. Diffusion of volatiles in the interstitial network was the main factor influencing retention. However evidence is presented indicating that adsorption, and insolubilization also influence retention rate. SP

150

[Flavour compounds in the soft drinks industry.]

Ballester, L.

Alimentaria No. 93, 29-37 (1978) [20 ref. Es]

This review-type article discusses aroma compounds obtained from lemons (soluble lemon), deterpenization of lemon essential oils, natural fruit flavours (particularly orange), problems of organoleptic control, triangular tests, and analytical methods (headspace method, liquid-phase chromatography). HBr

151

[Flavor compounds in barley, malt and wort.]

Kringstad, H. K.

Brygmesteren 34 (10) 215-227 (1977) [3 ref. No. en]

A series of studies on aroma compounds in barley, malt and wort is described. Wort was extracted with ether; barley and malt were extracted with 75% acetone, and malt flour was extracted with ether or 75% acetone. The aroma and UV absorption characteristics of the extracts were studied. A comparative 'mashing' trial was also conducted with commercial tannin, to evaluate the role of polyphenols in aroma formation. Compounds with characteristic flavour were extracted from wort with ether. Organic solvent-extracts of barley and malt lacked the characteristic flavour of wort extracts; however, if the barley or malt extracts are treated with water, the characteristic flavour is formed. Solvents giving a high concn. of polyphenol in solution also give relatively high flavour intensity. 'Mashing' trials with tannin gave extracts with a flavour resembling that of wort extracts. It is suggested that the characteristic wort flavour compounds may be formed by hydrolysis of polyphenols present in the grain. AJDW

152

The volatile aroma components of fermented ciders: minor neutral components from the fermentation of sweet Coppin apple juice.

Williams, A. A.; Tucknott, O. G.

Journal of the Science of Food and Agriculture 29 (4) 381-397 (1978) [37 ref. En] [Long Ashton Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

The minor neutral components present in a 1,2-propanediol-washed trichlorofluoromethane extract of a cider distillate were examined by GLC and GLC-MS. This led to identification of 10 alcohols, 7 carbonyls, 52 esters and 5 other components, and to tentative evidence for the identity of a further 32 compounds. 55 of these compounds have not

previously been reported in ciders. Odour evaluation of the separated components as they were eluted from the gas chromatograph suggested that many of the esters contribute to the apple fruit character of this beverage. AS

153

[Application of HTST-heating of the mash and its influence on the aroma composition during the production of apple brandy.] Anwendung der Maische-Hochkurzzeiterhitzung und deren Einfluss auf die Aromastoffzusammensetzung bei der Herstellung von Apfelbranntwein.

Schreier, P.; Drawert, F.; Steiger, G.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 167 (1) 16-22 (1978) [33 ref. De, en]

[Inst. für Lebensmitteltech. & Analytische Chemie der TU München, Lehrstuhl für Chem.-Tech. Analyse & Chem. Lebensmitteltech, D-8050 Freising-Weißenstephan, Federal Republic of Germany]

The influence of HTST-heating of the mash on aroma composition during production of apple brandy was investigated by GLC and coupled GLC-MS. Starting from the apple aroma the changes in aroma components were studied quantitatively during the conventional production (without enzyme inhibition) as well as after HTST-heating (enzyme inactivation) of the mash. 98 aroma compounds were determined in the course of mash production, fermentation and distillation. When employing HTST-heating the original aroma components of the apple, particularly the fruit esters, were present in appreciably higher concn. in the mash and in the distillate than with the conventional production method. HTST-heating reduced the concn. of secondary aroma substances in mash and distillate which are formed in the conventional method by enzymic-oxidative processes. In the unaged apple brandy obtained from HTST-treated mash, lower amounts of lactates and higher concn. of acetals were found compared with the conventionally produced distillate. AS

154

Direct head gas analysis for the isolation of volatile trace organics in aqueous environmental samples. Friant, S. L.

Dissertation Abstracts International, B 38 (4) 1632-1633; Order No. 77-22530, 471pp. (1977) [En] [Drexel Univ., 32nd & Chestnut Street, Philadelphia, Pennsylvania 19104, USA]

A systematic approach is presented for the development of quantitative direct head gas analysis for volatile trace organics in water. Fundamental information on 9 general trace organics partitioned into the vapour phase under varying aqueous and physical conditions are presented. A general optimum direct head gas isolation methodology is developed. The effect of parameter variation is quantitatively investigated by the use of the thermodynamic partition coefficient.

Under optimum direct head gas analysis conditions river and drinking water are routinely profiled to obtain analytical data to correlate with taste and odour panel work. Some of the trace organic constituents present in drinking water are qualitatively identified by MS. The method is then applied for the quantitative isolation and study of a specific pollutant identified in drinking water, e.g. chloroform. AS

155

[Supplementary information on the grassy off-flavour and aroma characteristics of wines and brandies.]

Leaute, R.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 59 (5) 191-192 (1977) [Fr] [Remy Martin, F 17 Cognac, France]

Studies of their aroma constituents were carried out in Charente in 1975 on 3 types of wine from the same raw material: from (i) dripping and first pressing, (ii) 2 final pressings, and (iii) fermentation of all pressings together. These wines were then distilled to 70° GL (Gay-Lussac) cognacs, which were organoleptically assessed and analysed for methanol, propanol, isobutanol, 2-methyl-1-butanol, 3-methyl-1-butanol, higher alcohols, hexanol and hexenol. (i) had a pronounced grassy character due to an increase in higher alcohols (ii) 4377 vs. (ii) 2573 and (iii) 3303 mg/l.) A muscat flavour in certain brandies, including those from Ugni blanc wine, could be traced to high methanol, hexanol and hexenol contents. KME

156

[Composition of the aroma substances of pumpkins.]

Banev, B.; Dyubova, P.; Rigo, Zh.

B'lgarski Plodove Zelenchutsi i Konservi No. 10, 12-14 (1977) [8 ref. Bg]

The aromatic substances present in the flesh of fresh pumpkins were determined after separation of ethereal oil by means of GLC: column length, 6 m; Carbowax stationary phase 20 M (3%) on Chromosorb W; column temp., 60-200°C; gas phase, N (30 ml/min); and flame-ionization detector. The separated components were identified in mass spectrometer, or by comparing the 'maximum' position with pure compounds. Over 60 chemical compounds were separated; 42 of these were identified. The predominating groups are the esters (24), especially esters of acetic acid, followed by 12 alcohols, 2 aldehydes, and 1 ketone. No acid was identified. STI

157

The accumulation of volatile substances in a large modern potato store.

Filmer, A. A. E.; Land, D. G.

Journal of the Science of Food and Agriculture 29 (3) 219-224 (1978) [18 ref. En] [ARC Food Res. Inst., Colney Lane, Norwich NR4 7UA, UK]

An apparatus for sampling and trapping the air from potato stores was developed and used to study the accumulation of volatile substances in a modern storage store over a season. Isopropyl-N-(3-chlorophenyl) carbamate (CIPC, chloropropham), together with 2 isomers of tetrachlorobenzene (present in the CIPC formation used), was present at all times after its application as a sprout suppressant, although the concn. fell with time. None of the known volatile substances associated with potatoes nor metabolites of isopropyl-N-(3-chlorophenyl) carbamate was detected. 2,3,4-trichloroanisole and pentachloroanisole were present at all times even before the store was filled, but did not reach levels at which taint occurred in the processed products. 8 commercial samples of isopropyl-N-(3-chlorophenyl) carbamate were analysed and the only major variation found was the presence of isopropyl-N-phenyl carbamate (CIPC, propham) in 2 formulations. AS

58

Gas-liquid chromatographic analysis of 2,4-dinitrophenylhydrazones of monocarbonyl compounds in carrots using glass capillary columns. Linko, R. R.; Kallio, H.; Rainio, K. *Journal of Chromatography* 155 (1) 191-194 (1978) [13 ref. En] [Dep. of Chem. & Biochem. & Lab. of Food Chem., Univ. of Turku, SF-20500 Turku 50, Finland]

The carbonyl compounds in the aroma distillate of carrots were isolated as their 2,4-DNPH's and analysed using the glass capillary GLC technique on an OV-1 capillary column at a column temp. programmed to rise at a rate of 4°/min from 150° to 250°. A chromatogram shows the successful separation of 18 of the 2,4-DNPH derivatives of the volatile carbonyl compounds of carrots. AL

159

[Effect of blanching on the content of aroma compounds in pears.]

Strandzhev, A.

B'lgarski Plodove Zelenchutsi i Konservi No. 7, 21-23 (1977) [5 ref. Bg] [Inst. po Ovoshcharstvo, Plovdiv, Bulgaria]

Qualitative and quantitative changes in aroma compounds as a result of blanching were studied in Williams and Passe Crassane pear var. Gas chromatography with the column packed with Chromosorb W 60/80 mesh with the Carbowax 20 M (10%) phase, was used for the detn. of aroma compounds. It was confirmed that compotes produced from non-blanching pears of the required state of ripeness possessed the highest content of aroma compounds. Blanching resulted in 2.5 times lower content of aroma compounds as well as changes in their quality. Blanching also inactivated a series of enzymatic processes and is therefore not recommended to be used during the manufacture of compotes. STI

160

Gas chromatographic and sensory analysis of volatiles from cling peaches.

Spencer, M. D.; Pangborn, R. M.; Jennings, W. G. *Journal of Agricultural and Food Chemistry* 26 (3) 725-732 (1978) [24 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

The contribution of volatiles to the odour of clingstone peaches was investigated by exit-port sniffing, descriptive flavour analysis, and GLC analysis of fresh samples of Halford peaches and of canned samples of Halford + 9 other peach var. Volatile constituents were isolated by steam distillation-extraction of the diced, fresh Halfords, and the concentrate was subjected to GLC analysis in high-resolution, glass capillary columns. On the basis of mass spectra and GLC retention times, 24 compounds, predominantly esters, monoterpenes, and γ -lactones, were identified. Compounds such as n-hexyl acetate, trans-2-hexenyl acetate, nonanal, tricosane, and γ -dodecalactone were present in fresh, but not in canned, Halfords. Volatiles which varied the most in concn. among the var. of canned peaches were isoamyl acetate, furfural, linalool, α -terpineol, γ -heptalactone, and geraniol. The γ -lactones, except γ -decalactone, were present in very small concn. Trained judges found large differences among the var. in: overall peach odour and flavour, fruity, floral and overcooked notes, and in sweetness and sourness. Stepwise multiple regression indicated that sensory characteristics were dependent on relative concn. of volatile compounds. Among the 10 peach var., differences were due more to relative concn. of esters and monoterpenes than to γ -lactones. The latter contributed the necessary 'peachy' background while the lower-b.p. compounds contributed fruity and floral notes. AS

161

[Studies on the characteristics of scented rice. III. Varietal differences of some carbonyl compounds evolved in cooking scented rice varieties.]

Tsuzuki, E.; Morinaga, K.; Shida, S.

Bulletin of the Faculty of Agriculture, Miyazaki University [Miyazaki Daigaku Nogakubu Kenkyu Jihou] 24 (1) 35-39 (1977) [10 ref. Ja, en]

GLC studies were conducted on formation of volatile carbonyl compounds during cooking of 52 'scented' rice var. (including some glutinous types). Constituents studied included acetaldehyde, propionaldehyde, methyl propyl ketone, and caproaldehyde. The results show that peak areas for these constituents were generally larger for scented than for normal var.; peak areas also differed between scented var., which could be classified into 8 groups on the basis of peak areas. Glutinous var. tended to have larger peak areas for caproaldehyde than non-glutinous var. The 'quality of flavour' and

'sharpness of flavour' of the scented var. were organoleptically evaluated; the results are compared to those for normal rice var., and presented diagrammatically. The results were very variable. Most scented var. had 'sharper' flavours than normal var.; some scented var. were superior, others inferior in quality of flavour to the normal rice var. studied. [From En summ.] AJDW

162

[Measurement of volatile carbonyl compounds in the vapour of cooked new rice and old rice.]

Endo, I.; Chikubu, S.; Tani, T.

Report of the National Food Research Institute [Shokuryo Kenkyusho Kenkyu Hokoku] No. 33, 1-6 (1978) [7 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric. & Forestry, Tokyo, Japan]

Flavour components in the vapour of cooked rice were identified with good reproducibility by gas chromatographic analysis. 7 carbonyl compounds were identified as acetaldehyde, acetone, isobutyraldehyde, n-butyraldehyde, isovaleraldehyde, n-valeraldehyde, and n-caproaldehyde. The chromatogram pattern of volatiles from new and old rice could be distinguished on the basis of higher amounts of carbonyl compounds in old rice; notably n-caproaldehyde which increased in proportion to the storage period. [From En summ.] JRR

163

Thermal decomposition of methyl oleate hydroperoxides and identification of volatile components by gas chromatography mass spectrometry.

Selke, E.; Frankel, E. N.; Neff, W. E.

Lipids 13 (7) 511-513 (1978) [8 ref. En] [N. Regional Res. Cent., Sci. & Education Administration, USDA, Peoria, Illinois 61604, USA]

The role of methyl oleate hydroperoxides as precursors of volatile compounds was investigated by thermal decomposition at 40°C in the injector port of a gas chromatograph (GC) attached to a computerized mass spectrometer. The GC-MS chromatogram gave 19 peaks, identified as heptane, octane, heptanal, 1-heptanol, octanal, 1-octanol, nonanal, 2-nonenal, decanal, c/t-2-decanal, t-2-undecanal, methyl heptanoate, methyl octanoate, methyl nonanoate, methyl 8-oxooctanoate, methyl 9-oxononanoate, methyl 10-oxodecanoate, methyl 10-oxo-8-decenoate and methyl 11-oxo-9-undecenoate, the first 11 of which correspond to those formed from triolein heated in air at 192°C. It was concluded that oleate hydroperoxides are the major precursors of volatiles produced from triolein even at 192°C. However these data are insufficient to prove that hydroperoxidation is the only route by which such products form. SP

164

Effect of changing gross composition of milk on the concentration of volatile compounds involved in flavour.

Jaddou, H. A. W.; Evans, E. W.

XX International Dairy Congress E, 86-87 (1977) [En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, UK]

Sulphur compounds, carbonyls and other flavour components were determined in volatiles from whole and skim-milks of low lactose, high whey protein or high alanine contents subjected to UHT or in-bottle sterilization. H₂S and CH₃SH concn. were higher in low-lactose milk and in-bottle sterilized skim-milk. Lower concn. of CS₂, COS and methyl sulphide in low-lactose milk may have been due to loss of precursors during ultrafiltration. [See FSTA (1978) 10 10P1408.] JMD

165

Contributions from individual volatiles to the flavour of Cheddar cheese.

Manning, D. J.

XX International Dairy Congress E, 293-294 (1978) [3 ref. En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, UK]

Using step-wise multiple regression analysis with the concn. of the volatiles as independent variables and panel scores as dependent variables, best correlations between Cheddar cheese quality or intensity of flavour and each of the volatile compounds individually were obtained with 2-pentanone, methane thiol, acetone and methanol. Multiple regression coeff. for Cheddar intensity and quality resp. as function of 2-pentanone, methane thiol and methanol were 0.84 and 0.77. [See FSTA (1978) 10 10P1408.] DMK

166

[Gas chromatographic analysis of amines in fish.] Tokunaga, T.; Iida, H.; Miwa, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 43 (2) 219-227 (1977) [16 ref. Ja, en] [Tokai Regional Fisheries Res. Lab., Kachidoki, Chuo-ku, Tokyo, Japan]

A simple method for gas chromatographic analysis of volatile amines in fish muscle has been devised. Amines such as monomethylamine, dimethylamine, trimethylamine, iso-propylamine, sec-butylamine, iso-butylamine, n-butylamine, pyrrolidine and iso-amylamine can be separated by this method. The sample solution subjected to gas chromatography was prepared by placing 2 ml perchloric acid extract of fish muscle into a small centrifugal tube with a stopper, adding 1 ml n-amyl alcohol and 2 ml 65% KOH, holding the mixture for 2-3 min at 50°C, shaking for 1 min, and centrifuging for 10 min at 2000 rev/min. An aliquot of the supernatant (n-amyl alcohol layer) was used for gas chromatographic analysis. Using this

method, changes in the concn. of amines formed in mackerel and squid muscle during storage at room temp. were examined. Considerable amounts of mono-, di- and trimethylamine, iso-butylamine, n-pylamine and iso-amylamine were detected in putrid fish. The formation of di- and trimethylamine was distinctly observed in putrid carp muscle free of trimethylamine oxide. Addition of betaine to the carp muscle promoted the formation of trimethylamine. On the other hand, addition of choline resulted in a remarkable increase in not only trimethylamine but also in dimethylamine levels, depending on the concn. of choline added. AS

67

The chemistry of the flavour precursors of cooked beef.

Marpe, A. C.

Dissertation Abstracts International, C 37 (1) 101 (1976) [En] [Univ. of Surrey, Guildford, Surrey, UK]

Extraction of beef with water or aqueous alcohol gave an extract which, when heated, produced a cooked beef odour whereas the extracted residue did not. The water soluble material was fractionated into broad groups of constituents by dialysis, gel filtration, and ion exchange chromatography, and the various fractions assessed for their cooked beef odour potential. The more interesting fractions were analysed qualitatively by GLC and quantitatively by ion exchange chromatography, colorimetry, UV spectrometry and GLC. The water soluble high mol. wt. fraction alone did not give cooked beef odour when heated whereas the water soluble low mol. wt. material did. Furthermore, the components responsible for this aroma were widely distributed in the fractions obtained by gel filtration. The application of the results to experiments with model systems showed that the precursors of cooked beef odour should include a source of H_2S as well as the relevant amino acids and sugars. The relative weakness of cooked beef odour given by the water soluble materials and its fractions, as compared with whole beef, may be related to the virtual absence of the H_2S precursor. As a result of this observation and the evidence obtained from a study of model systems it is felt that S may be provided largely by the meat protein. AS

168

[The flavour of meat.] [Review]

Rosset, R.; Liger, P.; Roussel-Ciquard, N.

Industries Alimentaires et Agricoles 95 (4) 345-355 (1978) [107 ref. Fr, en]

This review discusses the flavour compounds in meat, their origin and formation (Maillard reaction and fat autoxidation and the factors affecting meat flavour, including those related to the characteristics of the slaughter animal, and the effects of ante- and post-mortem treatment

(hormone injections, slaughtering conditions, maturing, boning, storage conditions, processing). Most important for flavour development is the method of cooking. The development of meat analogues with synthetic flavours is briefly considered. RM

169

Essential oils. II. Infra-red spectroscopy in the analysis of the volatile oils of cinnamon.

Wijesekera, R. O. B.; Fonseka, K. H.

Journal of the National Science Council of Sri Lanka 2 (1) 35-49 (1974) [16 ref. En] [CISIR, PO Box 787 Colombo 7, Sri Lanka]

IR spectroscopy was used for quantitative determination of the main constituents of cinnamon leaf, stem bark and root bark essential oils. The major constituents were: eugenol, cinnamaldehyde, acetyl eugenol, cinnamyl acetate and benzyl benzoate in leaf oil; cinnamaldehyde, eugenol and cinnamyl acetate in stem bark oil; and camphor, 1:8 cineole and cinnamaldehyde in root bark oil. Results obtained agreed well with those obtained by GLC. The method is recommended for fast and accurate routine analyses. Tables showing the peak assignments for qualitative analysis, and IR spectra of oils are included. [See *Journal of the National Science Council of Sri Lanka* (1973) 1 (2) 67-81 for part I.] RM

170

Essential oils. III. Chemical constituents of the volatile oil from the bark of a rare variety of cinnamon.

Wijesekera, R. O. B.; Jayewardene, A. L.

Journal of the National Science Council of Sri Lanka 2 (2) 141-146 (1974) [7 ref. En] [CISIR, POB 787, Colombo 7, Sri Lanka]

GLC and IR spectroscopic studies on the steam-volatile bark oil of an exotic var. of cinnamon (probably *Cinnamomum capparucoronade* Bl.) revealed the presence of 29% linalool, 23% eugenol and 16% 1:8 cineole, besides over 40 minor constituents. This var. has a bark oil of totally different chemical composition from that of *C. zeylanicum*, with an odour reminiscent of cloves and coriander. The leaf oil too was quite different from that of commercial cinnamon, with 1:8 cineole the main constituent and negligible eugenol content. [See preceding abstr.] RM

171

Essential oils. IV. Recent studies on the volatile oils of cinnamon.

Wijesekera, R. O. B.; Jayewardene, A. L.;

Rajapakse, L. S.; Fouseka, K. H.

Journal of the National Science Council of Sri Lanka 3 (2) 101-107 (1975) [10 ref. En] [CISIR, PO Box 787, Colombo 7, Sri Lanka]

Cinnamon stem bark, root bark and leaf oils were analysed by GLC and IR spectroscopy. All 3 oils possessed the same array of monoterpene

hydrocarbons but in different proportions. The main components were cinnamaldehyde (74%), camphor (60%) and eugenol (87%) resp. Root bark oil had a large monoterpene fraction of which 1:8-cineole was the major constituent (15%). There was not much difference between the monoterpene hydrocarbons in leaf and stem bark oil. All 3 oils contained the sesquiterpenes β -caryophyllene, α -ylangene and α -humulene. An IR spectroscopic method allowed direct detn. of eugenol, cinnamaldehyde, acetyl eugenol, benzyl benzoate, cinnamyl acetate, camphor and 1:8 cineole in a sample of oil from a single spectrum. [See preceding abstr.] RM

172

Studies on the essential oils of the Pakistan species of the family Umbelliferae. III. *Cuminum cyminum* Linn (cumin, safed zira) seed oil.

Karim, A.; Perrez, M.; Bhatti, M. K.

Pakistan Journal of Scientific and Industrial Research 19 (5/6) 239-242 (1976) [12 ref. En] [PCSIR Lab., Lahore 16, Pakistan]

The essential oil of Pakistani cumin seed was studied with a view to its commercial potential. Oil obtained from seeds from the Peshawar and Anetta regions gave resp. yields of 3.5 and 3.0% and contained: α -pinene, 1.1 and 0.7%; β -pinene, 14.3 and 19.7%; limonene, 0.4 and 1.5%; γ -terpinene, 11.5 and 16.3%; p-cymene, 6.0 and 2.7%; cuminaldehyde, 22.4 and 20.0%; 1,4-p-menthadien-7-al, 23.6 and 24.3%; 1,3-p-menthadien-7-al, 13.5 and 11.5%; cuminyl alcohol, 7.2 and 3.7%. These oils were comparable to good commercial oils from other sources. [See FSTA (1978) 10 4T104 for part II.] RM

173

Studies on the essential oils of the Pakistani species of the family Umbelliferae. IV. *Apium graveolens* Linn. (Celery, Ajmodh) seed oil.

Karim, A.; Bhatti, M. K.

Pakistan Journal of Scientific and Industrial Research 119 (5/6) 243-246 (1976) [12 ref. En] [PCSIR Lab., Lahore 16, Pakistan]

The essential oil and water cohobation oil of celery seed grown in the Jhelum and Lahore districts were studied with a view to its commercial potential. For the 2 regions the essential oil was obtained with 2.5 and 2.6% yield, the water cohobation oil with 0.55 and 0.49% yield resp. The essential oil contained 84.0 and 80.0 hydrocarbons having the following (%) composition: % limonene, 35.0 and 37.0; β -selinene, 32.5 and 28.5%; and no γ -terpinene and no humulene. The water cohobation oil from the 2 regions had the following (%) composition: hydrocarbons, 12 and 15; butylphthalide, 25 and 20; sedanonc anhydride, 60 and 63. Tabulated data for physicochemical characteristics and composition showed that Pakistani essential oils were comparable to oils produced elsewhere. [See preceding abstr.] RM

174

[Statistical analysis for the relationship between gas chromatographic profiles of soy sauce flavour and sensory evaluation.]

Aishima, T.; Nobuhara, A.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 51 (2) 65-74 (1977) [17 ref. Ja, en] [Cent. Res. Lab., Kikkoman Shoyu Co. Ltd., Japan]

The relationship between gas chromatographic profiles of soy sauce flavour and sensory scores were analysed using modified multiple regression analysis and stepwise regression analysis methods. In the analyses, the sizes of the gas chromatographic peaks, expressed in both absolute and relative values were transformed with 3 kinds of functions, i.e. logarithmic, square root and arcsine. Sensory scores for 49 soy sauce samples (purely fermented, acid hydrolysed, and partly acid hydrolysed types) were recorded on a 5-point scale. Linear combinations between the objective and sensory methods were observed for every transformation, but those from logarithmically transformed absolute values showed the greatest accuracy among them. Thus it seems possible that the flavour quality of soy sauce could be estimated objectively using multiple regression models and gas chromatographic data. The multiple correlation coeff., and the coeff. of multiple determination attain 0.9 at the 15th and 25th of 54 steps, resp. These results suggest the importance of selecting the efficient peaks from the chromatograph spectrum for accurate estimation. The degree to which individual peaks contributed to the estimation of quality (for each transformation) varied considerably, indicating a complicated relationship between flavour quality and quantities of aroma compounds. [From En summ.] JRR

175

[Comments on the paper 'The essential oil content of ground spices', by D. Strauss.] Bemerkungen zu der Arbeit von D. Strauss 'Der Gehalt an ätherischem Öl bei gemahlenen Gewürzen'. Gerhardt, U.

Deutsche Lebensmittel-Rundschau 73 (11) 366 (1977) [1 ref. De]

The paper of Strauss on the essential oil content of ground spices [see FSTA (1978) 10 3T86] is critically discussed, with special reference to the lack of differentiation between literature data for ground and intact spices. It is also pointed out that if essential oils are extracted and distilled with xylene, a correction factor (to allow for xylene carried over into the essential oil fraction) should be used. It is also stated that extraction with dekaline (decahydronaphthalene) gives better results than extraction with xylene. AJDW

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4

TECHNIQUES FOR ANALYSIS OF FLAVOUR VOLATILES

SELECTED FROM VOLUME 11

AND SCIENCE AND TECHNOLOGY ABSTRACTS

under the direction of

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H. BROOKES
EDITOR

Recovery of coffee volatiles.

MacDonald, D. L.; Weikel, J. A. (Procter & Gamble Co.) *United States Patent* 4 092 436 (1978) [En]

Cooled, roasted, and ground coffee is mixed with finely ground ice and formed into a bed through which water vapour is passed to melt the ice and uniformly wet the coffee, thereby uniformly stripping the essential volatiles which are collected in a cold trap. IFT

Determination of volatile substances in beer using gas chromatography.]

Sahler, M.; Cepicka, J.; Mostek, J.

Vysny Prumysl 24 (4) 73-77 (1978) [44 ref. Cs, ru, en, de] [Vysoka Skola Chemicko-tech., Prague, Czechoslovakia]

A method for detn. of volatile substances in beer using gas chromatography is described. For concn. of volatile substances prior to proper analysis, steam distillation was used followed by distillate extraction using a mixture of pentane and ethyl ether (1:2). The above method served for the detn. of alcohols, esters and fatty acids; their concn. in the beers analysed were within the limits of 66.4-125.6 mg/l. (alcohols), 14.1-43.4 mg/l. (esters) and 28.6-83.2 mg/l. (fatty acids). STI

3

Some products of the metabolism of ethyl 4-oxobutanoate by *Saccharomyces fermentati* in the film form on the surface of simulated flor sherry.

Freeman, B. M.; Muller, C. J.; Kepner, R. E.; Webb, A. D. *American Journal of Enology and Viticulture* 28 (2) 119-122 (1977) [11 ref. En] [Dep. of Chem., Univ. of California, Davis, California 95616, USA]

Volatile metabolites of ethyl 4-oxobutanoate were isolated from cultures of *Saccharomyces fermentati* growing in the film form on the surface of media synthesized to resemble flor sherry but containing ethanol as the only volatile carbon containing compound. Metabolites were isolated by distillation followed by extraction and evaporation of the extracting solvent. Volatiles were identified by gas-chromatographic retention times, and IR, NMR and mass spectrometry. *Saccharomyces fermentati* growing as a film on the surface of a 13% v/v ethanol, pH 3.4 medium converts ethyl 4-oxobutanoate into diethyl succinate, ethyl 4-hydroxybutanoate and 4-hydroxybutanoic acid lactone. 2-Phenethanol and 2- and 3-methylbutanol, and trace amounts of other unidentified compounds were formed. AS

4

[Effect of wine stabilization procedures on its volatile constituents.]

Shpritsman, E. M.; Aronina, I. V.

Vinodelie i Vinogradarstvo SSSR No. 4, 24-27 (1978) [Ru] [NPO "Yaloveny", USSR]

Soluble polyvinylpyrrolidone (PVP), insoluble PVP, methyl cellulose, silica gel, electrodialysis, and traditional methods of wine stabilization (bentonite, heat, cold) were studied for their effect on the

bouquet-forming volatile components (34 in number; including fatty acid esters, diacetyl, higher alcohols etc.); these were determined by gas chromatography. The new methods were not found to substantially change the volatile substances complex in wine. STI

5

Biosynthesis of benzaldehyde, benzyl alcohol and benzyl benzoate from benzoic acid in cranberry (*Vaccinium macrocarpon*).

Croteau, R.

Journal of Food Biochemistry 1 (4) 317-326 (1977, publ. 1978) [12 ref. En] [Dep. of Agric. Chem. & Program in Biochem. & Biophysics, Washington State Univ., Pullman, Washington 99164, USA]

The aroma complex of cranberry contains benzaldehyde, benzyl alcohol and benzyl benzoate as major components, and [7-¹⁴C]benzoic acid was converted into benzaldehyde, benzyl alcohol, benzyl benzoate, and minor amounts of other benzyl and benzoate esters in tissue slices of ripe cranberry. Hydrolysis of the benzyl benzoate indicated that the label was about equally distributed between benzoic acid and benzyl alcohol. [7-¹⁴C]benzaldehyde was converted in tissue slices into benzyl alcohol and benzyl benzoate, and hydrolysis of the ester indicated that only the alcohol moiety was labelled. Incubation of cranberry tissue slices with [7-¹⁴C]benzyl alcohol yielded primarily benzyl benzoate, and only the alcohol portion of the ester was labelled. All biosynthetic products were identified by radio chromatographic analysis and by preparation of derivatives, and the direct incorporation of precursors into biosynthetic products was demonstrated by chemical degradation studies. These results strongly suggest that, in the biosynthesis of benzyl benzoate, benzoic acid is 1st reduced to benzaldehyde, followed by reduction of the aldehyde to benzyl alcohol which is subsequently esterified. None of the aforementioned transformations of [¹⁴C]benzoic acid and its derivatives could be demonstrated in tissue slices from unripe (green) cranberry, suggesting that development of the ability to synthesize volatile benzenoid compounds is associated with ripening. AS

6

Volatile constituents of prickly pear (*Opuntia ficus indica* Mill., de Castilla variety).

Flath, R. A.; Takahashi, J. M.

Journal of Agricultural and Food Chemistry 26 (4) 835-837 (1978) [19 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

Volatile components of a commercial var. of prickly pear were concentrated by vacuum codistillation with water, followed by ether extraction of the distillate. The concentrate was examined by large bore capillary gas chromatography-MS, and 61 compounds were identified. Quantitatively, alcohols are the major class of compounds represented, although numerous esters and carbonyl compounds are also present at low concn. Some of the more interesting compounds found are a group of saturated and unsaturated 9-C alcohols. AS

7

Volatile aroma components of cooked artichoke.

Buttery, R. G.; Guadagni, D. G.; Ling, L. C.
Journal of Agricultural and Food Chemistry 26 (4)
791-793 (1978) [8 ref. En] [W. Reg. Res. Lab., USDA,
Berkeley, California 94710, USA]

The volatile oil of artichokes (*Cynara scolymus*), obtained by atmospheric steam distillation continuous extraction, was analysed by the direct combination of capillary gas chromatography and MS. 32 compounds were characterized. The major components were β -selinene and caryophyllene. Odour threshold detn. indicated that the components most important to the aroma included oct-1-en-3-one, hex-1-en-3-one, decanal, non-trans-2-enal, phenylacetaldehyde, and eugenol. AS

8

Two-phase sample preparation and concentration technique for sugar derivatives.

Martinez, M.; Nurok, D.; Zlatkis, A.
Analytical Chemistry 50 (8) 1226-1227 (1978) [4 ref. En] [Chem. Dep., Univ. of Houston, Houston, Texas 77004, USA]

For gas chromatography, samples should preferably be in conc. form, and sugar must also be converted to derivatives for analysis. A new method developed for study of very low concn. of sugars is based on a 2-phase system. Sugar silyl derivatives are prepared by reaction of the sample with (i) trimethylsilylimidazole to form a single phase, followed by addition of (ii) hexamethyldisiloxane to form 2 phases; the top phase is only 5-10% of the total vol. but contains all the sugar silyl derivatives, which are effectively conc. 10-20 \times . The top phase can be separated by centrifugation and injected into the gas chromatograph (details given). The method was originally applied for kestoses in molasses [see FSTA (1977) 9 1L19]; the present paper describes further applications to honey (20% solution in water), freeze-dried beer, sherry and raisins. Chromatograms shown for honey before and after formation of the 2nd phase reveal mono-, di- and trisaccharide peaks 10 \times larger from the 2-phase system. Mono-, di- and trisaccharides were also revealed in the other samples, except that raisins showed no trisaccharides, but produced large monosaccharide peaks and 12 disaccharides. ELC

9

Volatiles of corn kernels and husks: possible corn ear worm attractants.

Buttery, R. G.; Ling, L. C.; Chan, B. G.
Journal of Agricultural and Food Chemistry 26 (4)
866-869 (1978) [14 ref. En] [W. Regional Res. Lab., USDA, Berkeley, California 94710, USA]

The vacuum steam volatile oils of corn husks and kernels were analysed by capillary GLC-MS. A total of 56 compounds was identified in the corn husk volatile oil and 34 in the corn kernel volatile oil. Major components identified in the corn husk volatile oil included nonan-2-ol, nonanal, hex-trans-2-enal, hept-4-en-2-ol, and hexanol. Major components identified in the corn kernel volatile oil included nonan-2-ol, heptan-2-ol, hept-4-en-2-ol, and

undecan-2-ol. Unusual components identified included hept-4-en-2-ol, hept-4-en-2-one, α -ylangene, geranylacetone, β -ionone, and deca-2,4,7-trienal. AS

10

Isolation and identification of volatile components from wild rice grain (*Zizania aquatica*).

Withycombe, D. A.; Lindsay, R. C.; Stuiber, D. A.
Journal of Agricultural and Food Chemistry 26 (4)
816-822 (1978) [56 ref. En] [Dep. of Food Sci., Coll. of Agric. & Life Sci., Univ. of Wisconsin-Madison, Madison, Wisconsin 53706, USA]

The isolation and identification of flavour compounds characteristic of the popular gourmet item, wild rice, have heretofore been unreported. Wild rice volatiles were isolated using vacuum steam distillation followed by solvent extraction. The isolate was fractionated by preparative gas chromatography, and the fractions were subjected to gas chromatography-MS using 500 ft \times 0.03 in Carbowax 20M wall-coated open-tubular columns. Identifications were based upon flame ionization and alkali flame ionization detector responses, retention indices (I_R), and GLC-MS analyses in conjunction with the specific detectors. This first analysis of wild rice resulted in the identification of 112 compounds which are listed. AS

11

Volatile flavor components of cooked rice.

Yajima, I.; Yanai, T.; Nakamura, M.; Sakakibara, H.; Habu, T.

Agricultural and Biological Chemistry 42 (6)
1229-1233 (1978) [6 ref. En] [Kawasaki Res. Lab., T. Hasegawa Co. Ltd., Kawasaki, Japan]

Volatile flavour components of cooked rice were studied. Steam distillate of cooked rice was extracted with methylene chloride and the extract was separated into 4 fractions: acidic, weakly acidic, basic and neutral fractions. The neutral fraction was further separated into hydrocarbons and oxygenated compounds by column chromatography. All fractions were analysed by a combination of glass capillary GLC and MS. 100 constituents, including 13 hydrocarbons, 13 alcohols, 16 aldehydes, 14 ketones, 14 acids, 8 esters, 5 phenols, 3 pyridines, 6 pyrazines, and 8 other compounds, were identified. Of these, 92 were newly identified volatile flavour components of cooked rice. AS

12

Chemical analysis of flavour volatiles in heat-treated milks.

Jaddou, H. A.; Pavey, J. A.; Manning, D. J.
Journal of Dairy Research 45 (3) 391-403 (1978) [16 ref. En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, UK]

Effect of heat treatment of milk on low mol. wt. volatile compounds was studied in order to relate changes in the flavour of milks to changes in chemical composition. Milks were heat treated in a UHT plant for 3 or 90 s at 140 $^{\circ}$ C and stored at ambient temp. for periods up to 112 days. Volatile compounds in raw milk and in heated milks were isolated by a low temp. steam

tillation technique and identified using gas chromatography and MS. Cabbagey defects in heated lks were correlated with total volatile sulphur, and it is concluded that H_2S , COS , CH_3SH , CS_2 and $(CH_3)_2S$ could be responsible for this defect. AS

3

studies on kusaya. I. Comparison of composition of kusaya brine at Niijima and Oshima Islands.] Fujii, T.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 43 (5) 517-521 (1977) [11 ref. Ja, en] [Tokai Regional Fisheries Res. Lab., Kachidoki, Chuo-ku, Tokyo, Japan]

Kusaya is a special brined and dried fish produced in Niijima and neighbouring islands, and esteemed for its long shelf-life and unusual flavour. Chemical and microbiological analyses were carried out on 2 samples of kusaya brine from Niijima and 2 more from Oshima. The pH (6.9-7.1), ash (2.7-4.0%), water content (93.3-95.7%), NaCl concn. (2.7-3.7%), crude fat content (0.7-1.2%), amount of total N (397-467 mg/100 ml), volatile basic N (339-427 mg/100 ml) and viable cell counts on nutrient agar ($2.5-17 \times 10^8$ cells/ml) did not differ significantly among samples. The amine contents of brines from the 2 sources were quite different: trimethylamine was detected only in Oshima samples, and dimethylamine only in Niijima samples. Considerable differences in the contents of volatile sulphur compounds were also observed. [From *Enzymum.*] JRR

14

Basil oil production in Thailand.

Pichitakul, N.; Chomchalow, N.

Thai Journal of Agricultural Science 11 (1) 67-74 (1978) [6 ref. En] [Applied Sci. Res. Corp. of Thailand, Bangkok, Thailand]

This review discusses the cultivation, distillation, marketing, chemical properties and composition of Thai basil oil. The composition is shown in a gas chromatogram and table. 88.2% of the volatile oil consists of methyl chavicol + α -humulene (in a single peak). RM

15

Anise-like flavor of *Croton aff. zehntneri* Pax et Hoffm.

Craveiro, A. A.; Andrade, C. H. S.; Abreu Matos, F. J.; Wilson de Aleucar, J.

Journal of Agricultural and Food Chemistry 26 (3) 772-773 (1978) [6 ref. En] [Univ. Fed. do Ceara, Caina Pastal, 935, Fortaleza-Ceara, Brazil]

Estragole, the major constituent of the essential oil of *Croton aff. zehntneri*, family Euphorbiaceae, occurs together with minor quantities of camphor, anethole, isoborneol, caryophyllene, γ -elemene, safrol, methylisoeugenol, n-heptadecane, and n-eicosane. These compounds are reported for the 1st time in the genus *Croton*. 14 predominant volatile constituents of the oil were analysed by GLC-MS and identified. The oil has a typical pleasant odour reminiscent of anise (*Pimpinella anisum* L.) AS

16

Composition of Australian tea tree oil (*Melaleuca alternifolia*).

Swords, G.; Hunter, G. L. K.

Journal of Agricultural and Food Chemistry 26 (3) 734-737 (1978) [10 ref. En] [Corporate Res. & Development Dep., Coca-Cola Co. Atlanta, Georgia 30301, USA]

Australian tea tree oil, obtained by steam distillation of *Melaleuca alternifolia*, and an important source of the flavouring compound terpinen-4-ol, was studied. The oil was fractionated into 2 hydrocarbon fractions, 3 nonalcoholic oxygenated fractions and 3 remaining (mainly alcoholic) fractions by column chromatography on silica gel. Each fraction was then examined by GLC-MS. 40 components were identified, including viridiflorene for the 1st time in nature. Major components are 1-terpinen-4-ol, 1,8-cineole, γ -terpinene and p-cymene. DIH

17

Volatile constituents of cinnamon (*Cinnamomum zeylanicum*) oils.

Senanayake, U. M.; Lee, T. H.; Wills, R. B. H.

Journal of Agricultural and Food Chemistry 26 (4) 822-824 (1978) [6 ref. En] [School of Food Tech., Univ. of New South Wales, Kensington, NSW 2033, Australia]

Analysis of *Cinnamomum zeylanicum* leaf, stem bark, and root bark oils indicated 72 compounds, of which 32 have not been reported before in cinnamon oils. All 3 oils had a similar array of compounds but in varying proportions. Of the new compounds reported there were 11 monoterpenes, 4 sesquiterpenes, 2 aliphatic, and 15 aromatic compounds. AS

18

Comparison of odours directly and through profiling.

Dravnieks, A.; Bock, F. C.; Powers, J. J.; Tibbetts, M.;

Ford, M.

Chemical Senses and Flavor 3 (2) 191-225 (1978) [14 ref. En] [IIT Res. Inst., Chicago, Illinois, USA]

Odour qualities of 10 odorants were compared by 50 panelists of 4 cooperating laboratories. The odorants were: acetophenone, anethole, l-butanol, carvone, p-cresylmethylethyl, cyclohexanol, 1-heptanol, 1-hexanol, phenylethanol, and pyridine. In 1 method, dissimilarity was scored directly on a 7-point scale; results from different laboratories correlated at $P < 0.001$, and identical odours yielded scores well-discriminable from those for non-identical odours. In another method, odours were compared indirectly, by comparing their edited multidimensional profiles obtained using Harper's scale expanded to 136 descriptors; mean profiles from different laboratories correlated at $P < 0.05$ in 97% of cases. To eliminate semantic effects, a χ^2 statistic was applied to the individualized descriptor usage counts, providing a dissimilarity measure, $D_{CHI} = \ln(\text{coeff. of association})$; its value from different laboratories correlated at $P < 0.001$. However, a distinct discrimination of identical odours was possible only after adding some descriptors specific to alcoholic odours. D_{CHI} and dissimilarity scores related curvilinearly, but a linearity

($r = 0.88$) resulted for D_{CHI} vs. score/(8-score). Thus, D_{CHI} derivable from sufficiently articulate multidimensional profiles adequately substitutes for the direct dissimilarity scores, in addition, profiles indicate the nature of the dissimilarity. Fortran programs for the profile analyses are given. AS

19

Effect of pH on volatile retention in freeze-dried model solutions.

Smyrl, T. G.; LeMaguer, M.

Journal of Food Science 43 (4) 1357-1358 (1978) [11 ref. En] [Dep. of Food Sci., Univ. of Alberta, Edmonton, Alberta, T6G 2N2, Canada]

The retention level of several essential oil components (carvone, eugenol and piperitone) in freeze-dried solutions of sucrose and gum arabic was found to be dependent on the initial pH of the solution. In such carbohydrate solutions the presence of an acid or a base was found to enhance volatile retention. Retention values were found to be lowest near neutral pH values. IFT

20

Direct head gas analysis for isolation of volatile trace organics in aqueous environmental samples.

Friant, S. L.; Suffet, I. H.

Abstracts of Papers, American Chemical Society 176, ANAL 100 (1978) [En] [Acad. of Natural Sci., Philadelphia, Pennsylvania 19104, USA]

A systematic approach is presented for the isolation and quantitation of volatile trace organics from aqueous solutions by direct head gas analysis. Fundamental information is obtained on the partition process for a multiple solute system consisting of model compounds under varying aqueous matrix conditions, i.e., pH, temp. and salt addition. The effect of parameter variation is quantitatively investigated by the use of the thermodynamic equilibrium partition coeff. A general optimum head gas isolation methodology is obtained from statistical evaluation of the effect of parameter variation on the partition coeff. Under optimum head gas analysis conditions, river and drinking water are routinely profiled for the volatile trace organics that are present. AS

21

A study of volatile retention during freeze drying of tomato juice. [Lecture]

Gerschenson, L. M.; Bartholomai, G. B.; Chirife, J.

International Congress of Food Science & Technology - Abstracts p.137 (1978) [En] [Dep. de Ind., Fac. Ciencias Exactas y Nat., Univ., Buenos Aires, Argentina]

Factors (initial solids content, initial volatile concn., sample thickness and freezing rate) affecting volatile retention during freeze-drying of a liquid extract of tomato were studied by using ^{14}C -labelled butyl acetate as a model volatile, and the retention was determined by measuring the radioactivity of the samples with a liquid scintillation counter. In order to determine the possible role of adsorption in butyl acetate retention, adsorption-desorption experiments were also

conducted and discussed [See FSTA (1979) 11 2A60.] SP

22

Aroma recovery and sulphur dioxide preservation of orange juice. [Lecture]

Perez, R.; Gasque, F.; Izquierdo, L. J.; Lafuente, B. *International Congress of Food Science & Technology - Abstracts* p.137 (1978) [En] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

Juices from 'Verna' and 'Valencia' oranges were subjected to a 25% flash evaporation at 90° C, rapidly cooled to room temp. and protected with about 100 p.p.m. SO_2 ; recovered aromatic fractions were separately stored at -18° C. Periodically, the juices were reconstituted and their quality was assessed by determining their analytical and sensory characteristics. It was found that SO_2 content could be reduced below its sensory threshold by subjecting the juices to 3 successive stages of flash evaporation as follows: preheating at 130° C, holding for 2 s, and vacuum evaporation at 25° C. Acceptance of the reconstituted juices was not significantly affected by this treatment. After 3 months storage, the quality of the juices preserved by this method was considered satisfactory, and the vitamin C content exhibited practically no decrease. After 12 months, acceptance of the juices was still good, but over 50% of the vitamin C was lost. 2 types of single strength chilled juices were also prepared from 'Comuna' orange juice after being stored for 4 months: by the experimental SO_2 process; and as frozen, conc. 'cut back'. Comparative storage tests showed that acceptability of both juices was satisfactory after 30 days at 0-2° C, with no significant differences between them. [See FSTA (1979) 11 2A60.] SP

23

A semi-automated technique for the routine analysis of volatile organohalogenes in water purification processes.

Rensburg, J. F. J. van; Huyssteen, J. J. van; Hassel, A. I. *Water Research* 12 (2) 127-131 (1978) [11 ref. En] [Nat. Inst. for Water Res., Council for Sci. and Ind. Res., P.O. Box 395, Pretoria 0001, South Africa]

A rapid, semi-automated, sensitive and economical method is described by which organohalogen compounds, allegedly formed by the chlorination of surface and other waters, as well as volatile halogen compounds appearing in these waters, can be determined. This method, based on a rapid liquid-liquid extraction process and GLC analysis, using an electron capture detector, can handle ≤ 16 samples/8 h working day, increasing to 40 samples/24 h if the instruments are allowed to function overnight. Linear detection range of the system was found to be from 0.3 to 300 $\mu\text{g/l}$, with a lower limit of detection of 0.1 $\mu\text{g/l}$. AS

24

Determination of geosmin in beet juice by gas chromatography.

Tyler, L. D.; Acree, T. E.; Nelson, R. R.; Butts, R. M. *Journal of Agricultural and Food Chemistry* 26 (3)

4-775 (1978) [9 ref. En] [Dep. of Food Sci. & Tech., New York State Agric. Exp. Sta., Geneva, New York 1456, USA]

A method was developed for the detn. of geosmin (trans-1,10-dimethyl-trans-(9)-decalol) in beet juice. Geosmin was extracted with Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane), concentrated, and purified by adsorption on Florisil. Geosmin was identified using gas chromatography. The geosmin concn. was calculated by comparing the peak height of geosmin with that of an internal standard (1-undecanol). The accuracy and precision of the analysis were examined by adding known concn. of geosmin to a model solution (10% w/w ethanol in water) and to freshly expressed beet juice. Recovery of geosmin averaged 109% with s.d. of 11.7% over the range 0.1-10.00 ng/g. AS

5

Formation of volatile flavor compounds in green beans from linoleic and linolenic acids.

Ames, B. O. de; Stone, E. J.; Kazeniac, S. J.; Forsythe, H.

Journal of Food Science 43 (3) 698-702, 708 (1978) [4 ref. En] [Campbell Inst. for Food Res., Camden, New Jersey 08101, USA]

Both green beans and seeds formed n-hexanol, 2-hexanol and 1-octen-3-ol as the principal volatile compounds from [$U-^{14}C$]linoleic acid but at proportionately different ratios. With [$U-^{14}C$]linolenic acid, green beans developed mainly trans-2-hexenal, 3-penten-3-ol, 3-penten-1-ol, trans-2-hexenol and trans-3-hexenol, while seeds produced largely 3-penten-3-ol and 3-penten-1-ol with a small amount of trans-2-hexenal. Green beans showed the highest lipoxygenase activity of the several fruits and vegetables compared. Though alcohol oxidoreductase was relatively low, rapid reduction of aldehydes/ketones to alcohols was found in green beans. Green bean lipoxygenase was inhibited by cyanide, and a small fraction appeared to be quite heat stable, compared with alcohol oxidoreductase which was much more unstable. The optimal activity of green bean lipoxygenase was found to be at pH 5.8. IFT

26

Origin of raw peanut flavor.

Pattee, H. E.; Singleton, J. A.

Abstracts of Papers, American Chemical Society 176, AGFD 8 (1978) [En] [N. Carolina State Univ., PO Box 5906, Raleigh, N. Carolina 27650, USA]

Components which contribute to the flavour of raw peanuts have long been known to arise as a result of chemical degradation of lipid hydroperoxides. Recent studies have shown that these flavour components in raw peanuts arise as a result of enzymic reactions involving lipoxygenase and linoleic acid and that their production does not occur until mastication, homogenization, or some other cellular disruption process takes place. These findings open new avenues of research into the maintenance of raw peanut quality during harvesting, curing and storage prior to processing. Seed maturity and storage time are 2 factors which have been shown to have a significant effect on

enzymic origin of the raw peanut flavour volatiles. Periods of increased flavour-volatile production, particularly during storage, could render the seeds more susceptible to quality deterioration because of the peroxidative nature of the lipoxygenase-linoleic acid reaction. AS

27

Biological origin of flavors in vegetables.

Kazeniac, S. J.; Stone, E. J.; Forsythe, R. H.

Abstracts of Papers, American Chemical Society 176, AGFD 6 (1978) [En] [Campbell Inst. for Food Res., Campbell Place, Camden, New Jersey 08101, USA]

Many volatile, flavour-related compounds are developed enzymically when the cellular tissue of fruits and vegetables is disrupted. Though plant foods contain many of the same enzyme systems, they develop different patterns of volatile compounds, depending on the conditions and substrates available to the enzymes. Physical quality, maturity and ripeness, and methods used to prepare and process the food affect the volatile compounds produced. Biogenetic pathways leading to the formation of volatile compounds from linoleic and linolenic acids by lipoxygenase-mediated reactions will be reviewed. Other enzyme-flavour-related reactions, including aldehyde/ketone/alcohol relations, will also be discussed. Data showing the effects of the above factors on the development of volatile compounds in tomatoes, green beans and mushrooms are presented. AS

28

Gas-liquid chromatographic determination of lenthionine in shiitake mushroom (*Lentinus edodes*) with special reference to the relation between carbon disulfide and lenthionine.

Ito, Y.; Toyoda, M.; Suzuki, H.; Iwaida, M.

Journal of Food Science 43 (4) 1287-1289 (1978) [8 ref. En] [Nat. Inst. of Hygienic Sci., Osaka Branch: No. 6, Hoenzaka-cho, Higashi-ku, Osaka, 540 Japan]

A simple GLC procedure for the detn. of lenthionine, a flavour component in shiitake mushroom, was developed. The method involves the extraction of lenthionine with n-hexane from the soaked mushrooms and soak solution and subsequent detn. by flame photometric detector gas chromatography. Lenthionine was formed by soaking dried mushroom in water and warming at neutral or alkaline pH, but a little lenthionine was produced at acidic pH. The relation coeff. between the formation of lenthionine and the evolution of CS_2 in 20 samples was 0.507. It is assumed that lenthionine is formed by immersing the dried mushroom in water and gradually decomposes to CS_2 . IFT

29

Sensory evaluation of volatile amines detected and identified in tomatoes by GC/MS method. [Lecture]

Petro-Turza, M.; Kalmar-Blazovich, M.

International Congress of Food Science & Technology - Abstracts p.147 (1978) [En] [Cent. Food Res. Inst., 1525 Budapest, Hungary]

Methyl-, dimethyl-, trimethyl-, ethyl-, ethyldimethyl-,

n-propyl-, diethyl-, i-butyl- and i-pentyl-amine were detected in tomatoes and tomato products (puree, powder). The total volatile amine content of tomato fruit was found to be approx. 1 p.p.m.; puree contained half this amount and powder one-fifth. Further studies examined the odour of the above amines and their effect on tomato flavour. The flavour of tomato puree was adversely affected by the addition of single amines but significantly improved by a combination of i-butylamine and i-pentylamine. [See FSTA (1979) 11 2A60.] JA

30

Chemistry of guava fruit (*Psidium guajava*).

Wilson, C. W., III; Shaw, P. E.

Abstracts of Papers, American Chemical Society 176, AGFD 46 (1978) [En] [US Citrus & Subtropical Products Lab., PO Box 1909, Winter Haven, Florida 33880, USA]

The studies on guava fruit resulted in the identification of 9 new terpene and sesquiterpene hydrocarbons in addition to several compounds, previously reported in this tropical American fruit. The fragrant aromatic esters methyl benzoate, phenyl ethyl acetate, methyl cinnamate, and cinnamyl acetate probably contribute to typical guava aroma. Cinnamyl acetate is most guava-like. In addition to guava flavour chemistry some aspects of nutritional composition and processing technology are discussed. AS

31

The composition and flavor qualities of passion fruits.

Chan, H. T., Jr.

Abstracts of Papers, American Chemical Society 176, AGFD 44 (1978) [En] [USDA, Hawaii Fruit Lab., 1920 Edmondson Road, Honolulu, Hawaii 96822, USA]

Of the 50-60 edible spp. of *Passiflora*, only a half dozen or so bear fruit considered to be palatable. Only 2 spp. *P. edulis* Sims, the purple passion fruit, and *P. edulis* Sims f. *Flavicarpa* Deneger, the yellow passion fruit, are of any commercial significance. Indigenous to the tropical regions of N. and S. America, the yellow and purple var. are not widely cultivated throughout the subtropical and tropical regions. Passion fruits are valued not so much for their nutritional characteristics as for their exceptionally exotic aromas. Nevertheless, the 2 spp. are good sources of vitamin A and niacin. Their exotic flavours have been attributed to the presence of large amounts of the ethyl and hexyl esters of butyric and hexanoic acids with between 20 and 160 other volatile compounds also contributing to their flavours. Composition of the nutrients, flavour, and other compounds of significance in the various spp. of passion fruit are discussed. AS

32

Volatile flavor components of cooked odorous rice (kaorimai). [Lecture]

Nakamura, M.; Sakakibara, H.; Yanai, T.; Yajima, I.; Hayashi, K.

International Congress of Food Science & Technology - Abstracts p.146 (1978) [En] [Kawasaki Res. Lab., T. Hasegawa Co. Ltd., Kariyado 335,

Kawasaki, Kanagawa, Japan]

Headspace vapours obtained during cooking of so-called odorous rice, which produces more odour during cooking than ordinary rice, were conc. and then fractionated into 3 parts (neutral, acidic, basic). The neutral fraction was further separated into hydrocarbons and oxygenated compounds. All fractions were analysed by glass capillary GLC-MS. > 196 compounds were detected, of which 116 were identified including 20 hydrocarbons, 16 alcohols, 19 aldehydes, 11 ketones, 12 esters, 3 lactones, 18 acids, 2 phenols and 5 pyridines. A comparison of the volatile components of odorous and ordinary rice indicated that α -pyrrolidone is present only in the former; other differences were also found. [See FSTA (1979) 11 2A60.] JA

33

Volatile components of rice and rice bran. [Lecture]

Kato, H.; Tsugita, T.; Kurata, T.; Fujimaki, M.

International Congress of Food Science & Technology - Abstracts p.146 (1978) [En] [Dep. of Agric. Chem., Univ. of Tokyo, Bunkyo-ku, Tokyo 113, Japan]

Volatile concentrates (obtained from brown rice bran and powder by steam distillation and ether extraction) and headspace volatiles (collected in cold traps from cooked milled rice) were analysed by glass capillary GLC and GLC-MS. Approx. 270 compounds were detected in the volatile concentrates, of which 170 were identified. The major components of the volatile concentrates were 4-vinylguaiacol and 4-vinylphenol which have a characteristic unpleasant odour; these 2 compounds were also detected in the headspace volatiles of cooked rice. Further observations indicated that the volatile components contained in the outer part of the rice grain (e.g. phenols, lactones, ketones) are involved in the formation of the characteristic flavour of cooked rice. [See FSTA (1979) 11 2A60.] JA

34

[Examination of cheese for N-nitrosamine content.]

Kann, Yu. M.; Tauts, O. V.; Loigom, U. O.

Tallinna Polütehnilise Instituudi Toimetised No. 402, 61-63 (1976) [1 ref. Ru, en]

11 samples of Kostroma cheese made in June 1974 in the All-Union Buttermaking & Cheesemaking Industry Research Institute (VNIIMS) with the addition of 0-30 g NaNO₃/100 l. milk were examined by GLC for presence of volatile nitrosamines (sensitivity, 10 µg/kg). No nitrosamines were detected in any of the samples. SKK

35

[Aroma components of spices and herbs. II.] Die Aromastoffe der Gewürze und Würzkräuter. II.

[Review]

Oberdieck, R.

Fleischwirtschaft 58 (5) 801-810; 745 (1978) [198 ref. De, en] [Stettiner Strasse 62, 8650 Kulmbach, Federal Republic of Germany]

The series is continued with a review of phenolic compounds in essential oils. Their precursors and derivatives and their occurrence (e.g. in thyme, rosemary, origanum, cloves) and their flavouring.

tibacterial, pharmacological and antioxidant properties. [See FSTA (1978) 10 3T84 for part I.] RM

6

Aroma substances in natural essences from herbs, spices and drugs. IX.] Die Aromastoffe der natürlichen Würzessenzen aus Gewürzen, Kräutern und Drogen.

X.

berdieck, R.

Alkohol-Industrie 91 (7) 160-162 (1978) [De] [Stettiner Strasse 62, D-8650 Kulmbach, Federal Republic of Germany]

Data are given covering the origin, distribution, applications, main essential oil constituents and chemical composition of tarragon (*Artemisia dracunculoides*), mugwort (*Artemisia vulgaris*), savory (*Satureja hortensis*) and chervil (*Anthriscus cerefolium*). See *Alkohol-Industrie* (1976) 89 (17) 429-433 for part VIII.] TUB-IGB

37

Statistical analysis of gas chromatographic profiles of soy sauce aroma. [Lecture]

Aishima, T.; Nagasawa, M.; Fukushima, D.

International Congress of Food Science & Technology - Abstracts p. 149 (1978) [En] [Noda Inst. for Sci. Res., 399 Noda, Noda-shi, Chiba-ken 278, Japan]

The relationship between sensory scores for soy sauce and gas chromatographic profiles of soy sauce aroma was investigated by multivariate analysis. 8 brands of soy sauce were used in the study. Analysis of the chromatograms by stepwise discriminant analysis showed that the 8 brands could be clearly distinguished on the basis of calculated discriminant functions. The 8 principal aroma components explained >81% of the total variance in the chromatographic profiles. The relationship between these 8 components and sensory scores was analysed by multiple regression analysis. [See FSTA (1979) 11 2A60.] JA

38

[Flavour research today and tomorrow.]

Aromaforschung heute und morgen.

Dürr, P.

Alimenta 17 (3) 77-78, 81 (1978) [33 ref. De]

[Eidgenössische Forschungsanstalt für Obst-, Wein- & Gartenbau, CH-8820 Wädenswil, Switzerland]

Present flavour research is reviewed in the following sections: sensory aspects; instrumental analysis; formation of flavour compounds; flavour and quality of foods. RM

39

[Research on *Mentha piperata* Huds. "Italo Micham" grown at Rio Grande do Sul, Brazil.]

Sacco, T.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 60 (2) 63-65 (1978) [10 ref. It, fr, en] [Istituto di Botanica Speciale, Univ. di Torino, Turin, Italy]

M. piperata grown at Porto Alegre, Rio Grande do Sul (30° South) achieved good flower and essential oil

production. The composition of the essential oil differed from that produced in Italy, with 19.3% menthone (vs. 26.2), 12.4% menthofuran (vs. 4.4), 29.0% menthol (vs. 42.6) and 8.9% menthyl acetate (vs. 1.7). RM

40

[Formation of volatile substances in the Maillard reaction.] Zur Bildung flüchtiger Stoffe bei der Maillard-Reaktion.

Ludwig, I.; Böttger, K.; Freimuth, U.

Nahrung 21 (7) 591-597 (1977) [35 ref. De, en, ru]

[Wissenschaftsbereich Lebensmittelchem. & Tech. Biochem., Tech. Univ., 8027 Dresden, German Democratic Republic]

Technical acid casein, ground and extracted with methylene chloride, was either (i) mixed with lactose at approx. 5 mol lactose/1 free amino group or (ii) allowed to swell at pH 6.4, mixed in the same proportions with aqueous lactose solution, part of the mixture being freeze-dried in a VEB Schott laboratory freeze-drier, and (iii) part being freeze-dried in a VEB Hochvakuum Dresden industrial installation. (iii) had a moisture content of 1.3-2.1% vs. 9.7% for (ii); moisture content was adjusted to approx. 10% before sealing under pure N₂ in 30-ml ampoules and heating at 75°, 95° or 115° C for 0 to 4 h. Gas composition of head space was examined by GLC; colour of the product was measured in a VEB Carl Zeiss Leukometer; composition of pentane extracts was examined by TLC; and organoleptic assessment was carried out by a panel of 4-8 experts. It is concluded from tabulated results that pre-treatment of the components had a considerable effect on the Maillard reaction between casein and lactose, and comparison of GLC peaks showed the marked effect of heating intensity and duration. [See also FSTA (1975) 7 7P1491.] SKK

41

[Sensory characteristics of volatile oxidation products of fats. A literature survey.] [Review] Hall, G.

SIK Rapport No. 391, 64 pp. ISBN 91-7290-031-8 (1975) [56 ref. Sv, en] [SIK-Svenska Livsmedelinst., Fack, S-400 21 Göteborg 16, Sweden]

Aspects covered in this review include: volatile fat oxidation products in dairy products, and their significance for the sensory characteristics of the product; volatile fat oxidation products in vegetable oils, and their sensory significance; volatile fat oxidation products in other systems (with special reference to studies using model systems); and sensory interactions between volatile fat oxidation products. Numerous tables of literature data are given. A]DW

42

Gas-liquid chromatographic determination of volatile organic acids as benzyl esters with applications to tuna, shrimp, and eggs.

Staruszkiewicz, W. F., Jr.; Fernandez-Flores, E.; Bond, J. F.

Journal of the Association of Official Analytical Chemists 61 (4) 973-981 (1978) [26 ref. En] [FDA, Div. of Food Tech., Washington, DC 20204, USA]

Volatile acids are recognized as useful indicators of decomposition in a variety of foods. A method was developed for the rapid preparation of benzyl esters of formic, acetic, propionic, isobutyric, and butyric acids and for their quantitative detn. by GLC. Esters were formed by reaction with BCl_3 -benzyl alcohol, followed by washing with aqueous NH_3 before storage. They were chromatographed, using tetradecane as an internal standard, and were separated at 140°C on columns having DC-200 and SP-1000 as liquid phases. The method offers significant advantages, especially for the detn. of formic acid, over the present official AOAC method, 17.042-17.046. Recoveries of volatile acids added to steam distillates of tuna extracts were $\geq 91\%$, with mean recoveries for the 5 volatile acids of 96-104%. Applications to the analysis of canned tuna, frozen headless shrimp, and frozen whole egg resulted in recoveries of $\geq 82\%$ with mean recoveries for the 5 acids of 91-101%. The method was compatible with an automated gas chromatograph-data processing system. AS

43

Cause and fate of certain C_6 compounds formed enzymatically in macerated grape leaves during harvest and wine fermentation.

Joslin, W. S.; Ough, C. S.

American Journal of Enology and Viticulture 29 (1) 11-17 (1978) [25 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

The formation of leaf aldehyde and leaf alcohol, the most abundant volatiles of macerated grape leaves, was investigated in *Vitis vinifera* leaves and grapes. Several factors were found to influence the quantities formed, including physiological condition of the fruit or leaf and the degree and type of processing. Once formed, the leaf aldehyde was rapidly reduced and then saturated to *n*-hexanol. These changes were accelerated with increased temp. and the presence of yeast. The amounts of C_6 volatiles found in musts and wine were independent of whether grapes were mechanically harvested or not. AS

44

Gas chromatography-mass spectrometry system applications to the analysis of food and drugs.

Cairns, T.

Association of Food and Drug Officials, Quarterly Bulletin 42 (1) 3-24 (1978) [En] [US FDA, 1521, West Pico Boulevard, Los Angeles, California 90015, USA]

45

Changes in the composition of neutral volatile components during the production of apple brandy.

Schreier, P.; Drawert, F.; Schmid, M.

Journal of the Science of Food and Agriculture 29 (8) 728-736 (1978) [51 ref. En] [Inst. für Lebensmitteltech. & Analytische Chemie der TU, München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

The changes in aroma composition during apple-brandy production were investigated by GLC and coupled GLC-MS. Quantitative detn. of 97 aroma components showed that the aroma of unaged apple

brandy is characterized by components produced as a result of the yeast fermentation and technological processes such as mashing and heating rather than by the genuine apple-aroma components. Genuine apple-aroma constituents, predominantly esters, are degraded during the mashing process and can be detected only in trace amounts after the distillation. Distillation increased the concentration of ethyl esters and many of the higher alcohols, produced acetals and furan derivatives as well as damascenone, 2-methylhept-2-hepten-6-one and β -cyclocitral. Out of the 97 components studied, in apples, during fermentation, and in apple brandy are tabulated. AS

46

Contribution of hop-derived compounds to beer aroma. [Lecture]

Sandra, P.; Verzele, M.

Proceedings, European Brewery Convention 15th Congress, 107-122 (1975) [18 ref. En, de, fr] [Lab. of Organic Chem., State Univ., Krijgslaan 271 (S.4), B-9000 Ghent, Belgium]

Detection by gas chromatographic analysis of 4-methyl-3-pentenoic acid and 4-hydroxy-4-methyl-3-pentenoic acid lactone in hopped but not in unhopped beer confirms that hop-derived compounds contribute to the flavour of beer. The hoppy smell of beer, however, is considered to be due to a mass collaboration effect of hop essential oil components below the present detection limits of approx. $1\text{ }\mu\text{g/kg}$. [See FSTA (1979) 11 3H325.] MEG

47

Improvement of hop aroma in beer. [Lecture]

Pickett, J. A.; Coates, J.; Sharpe, F. R.

Proceedings, European Brewery Convention 15th Congress, 123-140 (1975) [19 ref. En, de, fr] [Brewing Ind. Res. Foundation, Nutfield, Surrey, UK]

A new extraction procedure involving vacuum steam distillation of hops at room temp. is described. The hop oil is obtained as an aqueous emulsion which may be added directly to bright beer or to beer at racking. Advantages of the process are: the bittering principles of hops are not degraded; and a pleasant hop aroma is imparted to beer without an adverse effect on shelf life. [See FSTA (1979) 11 3H325.] MEG

48

The practical use of oxygenation during fermentation for the control of volatile acetate ester concentration in beer. [Lecture]

Anderson, R. G.; Kirsop, B. H.; Rennie, H.; Wilson, R. J. H.

Proceedings, European Brewery Convention 15th Congress, 243-253 (1975) [10 ref. En, de, fr] [Brewing Ind. Res. Foundation, Nutfield, Surrey, UK]

A procedure is described for adding O_2 in solution to fermenting wort of high sp. gr. The O_2 is dissolved in water at high pressure and low temp. to give a conc. solution which can be added to the wort, with only a moderate dilution resulting. Addition of the O_2 solution to 20 l. wort for 4 h at an hourly rate of 15 mg/L accelerated the fermentation and reduced the acetate ester content. Successful experiments were also made on a large pilot plant scale (8-16 hl). [See FSTA (1979) 11 3H325.] MEG

50

Formation of phenols and oxygen-containing heterocyclic compounds in beer.]

Gaschromatographisch-massenspektrometrische Untersuchungen flüchtiger Inhaltsstoffe von Hopfen, Würze und Bier und deren Genese. II. Phenole und Sauerstoffhaltige Heterocyklen in Würze und Bier. [Lecture]

Wessl, R.; Kossa, T.; Renner, R.

Proceedings, European Brewery Convention 15th Congress, 737-756 (1975) [53 ref. De, en, fr]

Forschungsinst. für Chem.-tech. Analyse, Versuchs- und Lehranstalt für Brauerei, Inst. für Gärungsgewerbe und Biotechnik, Berlin]

Aroma compounds in wort and beer were extracted with n-pentane/ether (1:1) and examined by adsorption chromatography, gas chromatography and MS. More than 20 new phenolic components of wort and beer were identified including 4-vinylphenol, 4-hydroxybenzaldehyde, guaiacol, 4-vinylguaiacol, p-couegenol, vanillin, acetovanillon, 4-vinylsyringol, 4-ethylsyringol, 4-propenylsyringol, syringaldehyde, 4-methylfurfuryl alcohol, 2-acetylfuran, 4-methyl-2-acetylfuran, 2,5-di-(hydroxymethyl)-furan, and N-furfurylpyrrol-2-aldehyde. Decarboxylation products of sinapic and ferulic acids are considered as positive aroma compounds, while those from p-coumaric acid predominantly cause off-flavours. Introduction of barley var. with low p-coumaric acid contents is suggested. [See FSTA (1979) 11 3H325.] [See FSTA (1975) 7 12H1899 for part I.] MEG

50

Volatile compounds in distilled beverages.]

Khiabakov, T. S.

Vinodelie i Vinogradarstvo SSSR No. 3, 15-17 (1978) [Ru] [Vserossiiskii NIIViV, USSR]

Contents of aldehydes, esters, acetals, alcohols and volatile acids were studied using gas chromatography in Armenian, Georgian and Dagestani distilled beverages (brandies) of various brands. Assessed on the basis of scattering of data, the most stable were the Armenian brandies. The Georgian brandies were somewhat higher in enantiomer ester compounds, and the Dagestani brandies had the lowest volatile acids concn. Most of the higher alcohols consisted of n-propanol and isobutanol; methyl-2-butanol and methyl-3-butanol-1 were also found. Total ester content was 84-211 mg/100 ml; with ethyl acetate (88-90%) and ethyl lactate (5-9%) predominating. The concn. of isoamyl acetate, 1 of the major bouquet and flavour-formers was between trace and 0.7 mg/100 ml. STI

51

Assay into the volatile amines in tomatoes and tomato products. I. Gas-chromatographic analysis.

Madarassy-Mersich, E.; Petro-Turza, M.; Szarfoldi-Szalma, I.

Acta Alimentaria 7 (3) 195-207 (1978) [32 ref. En]

[Central Food Res. Inst., Herman Otto ut 15, H-1525 Budapest, Hungary]

In order to study the changes occurring in the volatile

components of tomato flavour during processing, the volatile amines were extracted by steam distillation and collected in dilute HCl solution subsequent to alkalization of the sample. After removal of ammonium chloride from the salt mixture residue of evaporation, the amines were liberated in sealed glass capillaries and re-dissolved in n-hexadecane. The amines were separated by gas chromatography on 2 different column packs (alkaline Carbowax 20 M and Chromosorb 103) applying appropriate temp. programmes. To identify the separated components the enrichment technique was used. As a result of the study, raw tomatoes and tomato products (puree, powder) were found to contain a great number of amines. The total amount of these compounds was highest in raw tomatoes and decreased during processing. Of the separated (13-16) components, 9 amines could be identified in the 3 sets of samples: methyl, dimethyl, ethyl, diethyl, propyl, i-butyl, butyl, i-pentyl and pentyl amine. Experiments are in progress on the amine components that could not be identified hitherto. AS

52

Identification of keto acids in Arctic bramble, *Rubus arcticus* L. as methyl esters of their 2,4-dinitrophenylhydrazones.

Kallio, H.; Linko, R. R.; Pyysalo, T.; Puntari, I.

Analytical Biochemistry 90 (1) 359-364 (1978) [19 ref. En] [Dep. of Chem. & Biochem/Lab. of Food Chem., Univ. of Turku, SF-20500 Turku 50, Finland]

The major keto acids in arctic bramble, *Rubus arcticus* L. were investigated. The acids were isolated with anionic and cationic ion-exchange resins, converted to 2,4-dinitrophenylhydrazones, and purified with an Al_2O_3 column. The derivatives were separated on a silica gel G thin-layer plate and esterified with methanol-HCl and the methyl esters of the keto acid 2,4-dinitrophenylhydrazones formed were analysed on an OV-1-glass capillary GLC column and with MS. 2-Oxoglutaric, pyruvic, oxaloacetic and glyoxylic acids were identified. The mass spectra of the derivatives are presented. AS

53

Volatiles in distillates of fresh radish of Japanese and Kenyan origin.

Kjaer, A.; Madsen, J. O.; Maeda, Y.; Ozawa, Y.; Uda, Y.

Agricultural and Biological Chemistry 42 (9) 1715-1721 (1978) [26 ref. En] [Dep. of Organic Chem., Tech. Univ. of Denmark, 2800 Lyngby, Denmark]

The steam-volatile constituents of fresh radish of Japanese and Kenyan origin were studied by the GLC-MS technique. The overall pattern of compounds in the 2 materials was similar. 10 mustard oils, of which pentyl, hexyl, and 4-methylpentyl isothiocyanate have not previously been reported as products of natural derivation, 2 related nitriles, dimethyl disulphide, methyl methanethiosulphonate and 1-methylthio-3-pentanone, a novel sulphide-ketone, together constitute the major volatile S products in the 2 radish materials. A few non-sulphur volatiles were also identified. The diversity in chemical structure of the S constituents becomes less surprising when regarded in terms of their biogenic origin. AS

54

[Mushroom aroma. Sensory properties of 1-octen-3-ol structural analogues.] Champignon aroma.

Organoleptik von Strukturanalogen des 1-octen-3-ol.

Ney, K. H.; Freytag, W. G.

Gordian 78 (5) 144, 146 (1978) [4 ref. De, en] [Unilever Forschungsgesellschaft mbH, Hamburg, Federal Republic of Germany]

A homologous series of racemic alcohols with the general formula $R-CHOH.CH=CH_2$ (R = methyl to pentyl residue) was investigated for mushroom smell (*Psalliota compestris* or *Agaricus hortensis*). Except for 1-octen-3-ol (the main component), only 1-hepten-3-ol had a faint mushroom smell. Lower homologues had quite different smells. Very weak mushroom smell was detected in the saturated analogue i.e. 3-octanol and none in 2-octanol, 1-octanol, 1-nonanol and 1-heptanol, showing that the smell was dependent on the double bond and the 3-position of the OH group. RM

55

Hydrodispersible natural colour extracted by means of orange oil from citrus waste materials.

Rovesti, G.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 60 (2) 66-68 (1978) [En] [Speda-Roccalumera Ltd., Citrus Ind., PO Box 158, Messina, Italy]

A dispersible powder for colouring and flavouring orange drinks was produced from the essential oil and carotenoid pigments of orange peel. The product of a first extraction was recycled on a mixture of de-oiled orange peel and pulp, to give an extract with 157 p.p.m. total carotenoids (89.5% xanthophylls). Recycling orange essential oil on flavedo from whole oranges produced an extract with 336 p.p.m. total carotenoids (87.7% xanthophylls). To obtain a highly coloured water-dispersible product, colour extract was dispersed in an aqueous emulsion containing natural and modified polysaccharides (a mixture of unmodified hydrolysed starches, enzyme-treated water extract of orange peel and 3% gum acacia or sodium caseinate) and spray dried at $<75^\circ\text{C}$ in a 75% N_2 , 21% CO_2 , 4% O_2 gas mixture at a water:soluble:fat soluble substance ratio of 1.8 and a water:total DM ratio >10 , atomizer rotation rate 7000 rev/min. The product was a deep yellow powder of medium density, easily dispersible in water at 40°C (or in cold water with stirring) at a water:powder ratio $\geq 3:1.1$ g powder/l. gave a drink of good colour, weak but stable cloud, and pleasant taste. 7% of carotenoids in the extract was lost in spray-drying. No significant changes in carotenoid contents or composition were observed after 120 day storage at 35°C away from direct light. Colour changes in prepared drink are prevented by 100 p.p.m. ascorbic acid. RM

56

Possible relationships among sour oranges by analysis of their essential oils.

Ortiz, J. M.; Kumamoto, J.; Scora, R. W.

International Flavours and Food Additives 9 (5) 224-226 (1978) [9 ref. En] [Cent. Regional de Levante (07), Burjasot, Valencia, Spain]

Essential leaf and rind oil components were used as criteria for delimitation of subgroups or possible hybrids within the Sour Orange Group. The following forms were included in the study: Bittersweet, Par Bergamot, Daidai, Nansho daidai, Myrtifolia, Ch Seville, Bouquet de fleurs, Granitos, Salicifolia, Gadadehi, Kinkoje, Konejime, Sour Orange, Tabulated data give the % of the essential leaf oil and rind oil components of the selected cultivars. Distillations and variations in the % of the essential leaf oil components in Standard sour cultivar are also tabulated. VJG

57

Cubic spline interpolation for the calculation of retention indices in temperature-programmed gas-liquid chromatography.

Halang, W. A.; Langlais, R.; Kugler, E.

Analytical Chemistry 50 (13) 1829-1832 (1978) [6 ref. En] [Res. & Development Dep., Coca-Cola GmbH, Kaninenbergstrasse 66, 4300 Essen 1, Federal Republic of Germany]

A method is described for the calculation of retention indices based on nonlinear calibration data in temp.-programmed GLC. A table shows the retention times of the n-alkane standards C7-C18 and compares the retention indices, calculated by the spline and polygon methods resp., of 15 peaks of a cold pressed lemon oil chromatographed 17 times. AL

58

[Investigation of the flavour components of Fontina, an Italian cheese.] Untersuchung der Aromabestandteile von Fontina, einem italienischen Käse.

Ney, K. H.; Wirotama, I. P. G.

Fette Seifen Anstrichmittel 80 (6) 249-251 (1978) [15 ref. De, en] [Unilever Forschungsgesellschaft mbH, Behringstrasse 154, D-2000 Hamburg 50, Federal Republic of Germany]

4 loaves of commercial, mature Fontina cheese (a speciality product from the Aosta valley) and one similar cheese from Locatelli were examined. The overall composition, free amino acids and the α -keto acids from the aroma concentrate are shown in tables. About 45% of the free amino acids in the cheeses consisted of glutamic acid, leucine, phenylalanine and lysine. The flavour concentrates obtained by steam distillation or degassing and ethyl chloride extraction contained 13 α -keto acids at 0.01-0.25 $\mu\text{mol/kg}$ cheese (i.e. about double the amount found in Provolone cheese) and very small quantities of amines. RM

59

[Quantitative determination of the constituents of coriander oil by gas chromatography.]

Polyakov, A. F.; Saad, M. M.; Suevalova, V. V.

Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 3, 99-103 (1978) [10 ref. Ru] [Krasnodarskii Politekh. Inst., Krasnodar, USSR]

The effect of controllable factors (the ratio of the relative concn. of the constituent to the control and the size of the sample) and the method of chromatographic processing (peak height, area, ratio of the distance and

ght) on the reproducibility of the coeff. relating to basic constituents of coriander oil was studied. The quantitative detn. of linalool may be carried out by the external standard method; the procedure is described. Linaliol, geranyl acetate and borneol may be determined together with linalool with 2 standards, tridecane and benzyl alcohol. Decyl alcohol is recommended as internal standard for camphor. STI

D

analytical methods and techniques for studying the chemical composition of essential oils.] [Review] Carnero, J.
Revista Italiana Essenze, Profumi, Piante Officinali, Romi, Saponi, Cosmetici, Aerosol 60 (6) 328-359 (1978) [108 ref. Fr] [Robertet, F 06130 Grasse, France]
 This lecture discusses modern instrumental methods used in the analysis of essential oils, including structural analysis, detn. of minor and trace constituents and metabolites. It quotes various examples, including anise essential oil. RM

51

Flavor technology: profiles, products, applications. [Book]

Leath, H. B.
 vii + 542pp. ISBN 0-87055-258-9 (1978) [many ref. En]
 Westport, Connecticut, USA; AVI Publishing Company
 Bush Boake Allen, Ltd., Blackhorse Lane, London, UK]

This book is intended for workers in the food, beverage and other industries producing goods for consumption, who have involvement with the flavour of their end-products. The technology described is selective and intended to give sufficient information on processing techniques and conditions to enable the flavorist, the food technologist and those involved in technical service to discuss, develop and apply flavors to achieve the optimum effect in the end-product. The text has been divided into 3 sections: Flavor profiles (pp. 3-207); Flavor products (pp. 211-383); and Flavor applications (pp. 387-522). The first sets out in an ordered sequence the aromatic profiles of the main natural flavoring materials widely used in foods, beverages, confectionery etc. The second section deals with the nature and preparation of flavouring materials and products for use in food processing. The final section is a review of the technology and use of flavourings in the main branches of the industries concerned. Chapters included are: The culinary herbs (pp. 3-25, 74 ref.); The spices (pp. 26-72, 40 ref.); Aromatic vegetables and mushrooms (pp. 167-181, 35 ref.); The citrus fruits (pp. 182-197, 46 ref.); Vanilla (pp. 198-207, 22 ref.); Flavouring materials (pp. 211-367, 25 ref.); Creation and development of flavorings (pp. 368-383, many ref.); Flavors in food processing (pp. 387-391); Meat, poultry and fish products (pp. 392-413, 60 ref.); Baked goods and bakery products (pp. 414-426, 17 ref.); Snack foods (pp. 427-433, 10 ref.); Sugar and chocolate confectionery (pp. 434-451, 41 ref.); Pickles and sauces (pp. 452-468, 26 ref.); Soups (pp. 469-478, 4 ref.); Ice cream and frozen goods (pp. 479-492, 14 ref.); Soft drinks and beverages (pp. 493-506, 26 ref.); and Quality assurance of highly-flavored products (pp. 507-522, 32 ref.). An

appendix: English, French and German terms used in sensory descriptive analysis, is included. VJG

62

[The quality of pepper on sale in Slovenia.]

Sirnink, V.; Skvarca, M.; Golob, T.

Zbornik Biotehniške Fakultete Univerze v Ljubljani 28, 243-251 (1977) [16 ref. Sn, en] [Biotehniška Fak., Univ., Ljubljana, Yugoslavia]

Studies were conducted on retail samples of (i) ground black pepper, (ii) whole black peppercorns and (iii) whole white peppercorns, on sale in Slovenia. Mean values for composition were for (i), (ii) and (iii) resp. (%): moisture, 12.40, 11.78 and 14.19; DM, 87.60, 88.22 and 85.81; ash, 3.33, 4.22 and 0.74; HCl-insoluble ash, 0.91, 1.41 and 0.01; crude protein, 12.60, 14.36 and 12.50; starch, 33.60, 35.47 and 47.60; volatile oils, 1.44, 1.68 and 1.46; and piperine, 4.40, 6.15 and 5.53. These results are discussed in relation to current standards and literature data. In general, essential oil and piperine concn. were lower than those reported in the literature; essential oil concn. were lower than those specified in Yugoslavian standards. AJDW

63

Application of high-performance liquid chromatography to the analysis of volatile oils.

Ross, M. S. F.

Journal of Chromatography 160 (1) 199-204 (1978) [15 ref. En] [Pharmacognosy Dep., Welsh School of Pharmacy, UWIST, King Edward VII Avenue, Cardiff, UK]

The use of high performance liquid chromatography (HPLC) in the analysis of a number of commercial volatile oils is described. The HPLC method is simpler than GLC because of the selectivity of the detector, and it is quicker. The system was applied to the detn. of carvone in spearmint and dill oils, separation of extract of gripe-water, detn. of eugenol in pimenta and clove oils, menthone in peppermint oil, etc. For certain volatile oil constituents fluorescence detection is of value. VJG

64

Chlorohydrins in protein hydrolysates.

Velisek, J.; Davidek, J.; Hajslova, J.; Kubelka, V.; Janicek, G.; Mankova, B.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 167 (4) 241-244 (1978) [20 ref. En, de] [Dep. of Food Chem. & Analysis, Inst. of Chem. Tech., CS-166 28 Prague 6, Czechoslovakia]

4 samples of neutral fractions of protein hydrolysates were separated by GLC and the individual components were identified from the mass spectra obtained. Some of the identified compounds have not previously been reported as volatile components of foods. 3 of these compounds, 3-chloropropan-1-ol, 2,3-dichloropropan-1-ol, and 1,3-dichloropropan-2-ol, were toxic chlorohydrins. 1,3-dichloropropan-2-ol was present in samples in concn. of 0.17-0.94 mg/kg. To check the possibilities of the formation of these chlorohydrins and to find their precursor, glycerol + HCl mixtures were heated under conditions for production of protein

hydrolysates. All 3 chlorohydrins, formerly found in protein hydrolysates, were also identified in these model systems. AS

65

[Study of aroma compounds by modern instrumental methods.]

Maarse, H.

Voedingsmiddelentechnologie 11 (25) 10-13 (1978)
[6 ref. Nl, en, de][CIVO-TNO, Zeist, Netherlands]

Methods for study of aroma substances in foods and beverages are briefly discussed, with reference to GLC, MS, proton magnetic resonance, and IR spectroscopy. Applications are discussed with reference to identification of chloroanisoles as the cause of musty off-flavours in foods, and studies on offensive odours in the environment. AJDW

66

The isolation and identification of new staling related compounds from beer.

Williams, R. S.; Wagner, H.

Journal of the American Society of Brewing Chemists 36 (1) 27-31 (1978) [14 ref. En][Beverage Sci. Dep., Labatt Breweries of Canada Ltd., London, Ontario N6A 4M3, Canada]

Staled beers assume brandy-like, 'winey' aroma and flavour characteristics in bottled products after about 3 months in warm storage and intensify with time. The object of this study was to isolate from staled beer, under as mild conditions as possible, a fraction containing these winey characteristics and identify the responsible component(s). Preliminary fractionation is achieved by controlled low temp., vacuum distillation of beer, and extraction of a cut, trapped out in dry ice-acetone, into trichlorofluoromethane (Freon 11) yielding a concn. extract. Preparative gas chromatography of this extract enables further refinement of the winey fraction by trapping the appropriate peak in a glass capillary U-tube immersed in crushed dry ice. These sealed U-tubes are crushed in the injection port of an analytical gas chromatograph and the winey fraction components investigated using MS. Ethyl iso-valerate and ethyl 2-methyl butyrate were identified as important components in the staling of beers. AS

67

Determination of volatile halogenated hydrocarbons in water with XAD-4 resin.

Renberg, L.

Analytical Chemistry 50 (13) 1836-1838 (1978) [17 ref. En][Special Analytical Lab., Nat. Swedish Environment Protection Board, Wallenberg Lab., Univ. of Stockholm, S-106 91 Stockholm, Sweden]

The detn. of trihalomethanes, chloroethenes, and dichloroethane in water was carried out by adsorption on an XAD-4 polystyrene resin, followed by elution with ethanol. The method results in an extract concentrated enough for both chemical detn. and small scale biological tests. By using 2 series-connected columns, the degree of adsorption was studied and the chloroethenes were found to be more strongly

adsorbed than the haloalkanes. The recovery was found to be 60-95% of the substances studied. AS

68

Study of water treatment effects on organic volatiles in drinking water.

Thomason, M.; Shoults, M.; Bertsch, W.

Journal of Chromatography 158, 437-447 (1978)
[43 ref. En][Dep. of Chem., Univ. of Alabama, Alabama 35486, USA]

Volatile organics were determined during all stages of the water treatment process in a municipal water works. Analytical parameters for a quantitative procedure were investigated. The method used allows simultaneous detn. of both halogenated and non-halogenated purgeable organics. Approx. 70 substances were identified by gas chromatography/MS with capillary columns. Well water contained considerable quantities of aliphatic and aromatic substances. Halocarbons were formed during both steps of a double chlorination procedure, but the largest quantity was generated during the 1st step. Only tetrachloroethylene was present in untreated surface water in significant quantities. Most hydrocarbons were carried through the treatment process from the raw water to the finished water with little change in concn. AS

69

Studies of the volatile composition of hops during storage.

Tressl, R.; Friese, L.; Fendesack, F.; Köppler, H.

Journal of Agricultural and Food Chemistry 26 (6) 1426-1430 (1978) [13 ref. En][Lehrstuhl für Chem.-tech. Analyse, Tech. Univ. Berlin, Berlin]

140 constituents of Spalter hops (among them terpenes, sesquiterpenes, esters, ketones, aldehydes, alcohols, lactones, ethers, and fatty acids) were characterized and (semi)-quantified by means of distillation-extraction, liquid-solid chromatography, and capillary gas chromatography-MS. After a storage period of 3 yr, the changes of individual components were determined. Terpene and sesquiterpene hydrocarbons are decreased by polymerization and oxidation. To some extent they are transformed into hydrophilic components such as epoxides, alcohols and aldehydes, which may be easily transferred to beer. In addition, components such as aldehydes and fatty acids, which are known as off-flavour constituents in beer, are formed. Results are tabulated in detail. AS

70

Gas chromatographic-mass spectrometric investigation of hop aroma constituents in beer.

Tressl, R.; Friese, L.; Fendesack, F.; Köppler, H.

Journal of Agricultural and Food Chemistry 26 (6) 1422-1426 (1978) [10 ref. En][Lehrstuhl für Chem.-tech. Analyse, Tech. Univ. Berlin, Berlin]

110 aroma constituents of a German beer (Pilsener type), which delivered a desirable, fine hops aroma, were identified and semiquantified by means of liquid-liquid extraction, liquid-solid chromatography, and capillary gas chromatography-MS. 45 constituents (among them esters, ketones, alcohols, ethers, terpenoids, and sesquiterpenoids) were characterized

the 1st time in beer. 47 of the determined volatiles been found in Spalter hops. AS

fluence of preclarification of musts and of sulphite treatment on content of volatile substances of wines and brandies. II. Brandies.]

Trly-Brugerolle, C.; Sarre, C.; Bertrand, A.
Annales de la Vigne et du Vin 12 (2) 111-120 (1978) [4 ref. Fr, en, de, es, it] [Inst. d'Oenologie, Univ. de Bordeaux II, 351 cours de la Liberation, 33405 Talence, France]

To study the effect of preclarifying musts on the volatile compounds of brandies, an unclarified control sample and 5 preclarified samples of wine from white semi must were analysed as wine drawn off without SO₂ addition, wine drawn off with addition of 6 g SO₂/hl, and wine containing lees. After distillation (Sherrington method), chromatography showed that 90% of the volatile compounds of the wine passed into the distillate (60% of wine methanol), but only 3% of the benzyl-2 ethanol. The control showed greatest values for higher alcohols except propan-1-ol (total higher alcohols: control, 3258, vs. 1795-2372 mg/l.), but the preclarified samples showed greater values for higher esters (total: 71.3-107 vs. control, 40.1 mg/l.), especially ethyl octanoate and decanoate. The addition of SO₂ had no apparent effect on the content of total higher alcohols (SO₂ treated wine, 2049 and 3258 vs. untreated wine, 2036 and 3279 mg/l. for clarified and unclarified musts resp.), but the total higher esters were increased (14.4 and 40.1 vs. 55.4 and 9.0 mg/l. resp.). The presence of lees made no difference to the content of higher alcohols, but the content of higher esters was increased by the presence of lees. [See FSTA (1978) 10 10H1326 for part I.] KME

72

Problems experienced in the isolation of fruit flavours.

Corline, P. A.

South African Food Review 5 (3) 76, 78, 81, 82, 125 (1978) [36 ref. En]

Problems involved in the isolation of fruit flavours are discussed. Methods and equipment used for separation and extraction of flavours, and their advantages and disadvantages are reviewed and include: simple pass atmospheric concentration, whereby the juice is flash evaporated and aroma rich vapours are separated from the unevaporated juice; solvent extraction, which involves transport of aroma volatiles from the juice to a second phase (an immiscible liquid); reverse osmosis, which squeezes the water out of the juice; and freeze concentration which involves changing the aqueous phase of the juice to the solid state and the ice subsequently removed. SP

73

Compounds new to essential orange oil from fruit treated with abscission chemicals.

Moshonas, M. G.; Shaw, P. E.

Journal of Agricultural and Food Chemistry 26 (6) 1288-1290 (1978) [13 ref. En] [US Citrus & Subtropical Products Lab., USDA, Sci & Education Administration,

Federal Res., Winter Haven, Florida 33880, USA]

The compositions of volatile constituents in essential oils from control and chemically treated Hamlin, Pineapple and Valencia oranges were compared. The chemicals were abscission agents used to loosen fruit for mechanical harvesting. 6 phenolic ethers, eugenol, methyleugenol, cis-methylisoeugenol, trans-methylisoeugenol, elemicin, and isoelemicin, were isolated and identified as citrus constituents for the first time, but only from the chemically treated fruit. Threshold levels in orange juice were determined for 4 of these ethers. The concn. of all 6 compounds in the essential oil and processed juice from oranges were estimated; amounts in juice were, in order, 21, 42, 4.2, 21, 10 and 31.5 p.p.m. AS

74

Quantitative composition of cold-pressed grapefruit oil.

Wilson, C. W.; Shaw, P. E.

Journal of Agricultural and Food Chemistry 26 (6) 1432-1434 (1978) [14 ref. En] [US Citrus & Subtropical Products Lab., Sci. & Education Administration, Federal Res., USDA, Winter Haven, Florida 33880, USA]

The major volatile components of Florida cold-pressed white grapefruit oil were quantitatively analysed by gas chromatography. Corrected wt.% were determined from response factors and the % of nonvolatiles in the whole oil. Of the 24 identified constituents, 19 were quantitated. Data for only 9 of the 19 could be compared with literature values, but the agreement was generally good. The octanal:decanal ratio was slightly greater than 1. Quantities of the 2 major esters, octyl and neryl acetates, are reported for the 1st time. AS

75

[On some components in steam distillate of sweet potato.]

Nagahama, T.; Inoue, K.; Nobori, Y.; Fujimoto, S.; Kanie, M.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 51 (10) 597-602 (1977) [19 ref. Ja, en] [Dep. of Agric. Chem., Fac. of Agric., Kagoshima Univ., Kourimoto, Kagashima-shi, Japan]

Whole sweet potato tubers were divided into outer (5 mm thick) and inner portions, and steam distilled. The distillate from the inner part had a mild flavour, but that from the outer part had a strong disagreeable odour; GLC, TLC and MS studies identified acetaldehyde, and smaller quantities of formaldehyde, propylaldehyde and butyraldehyde, as the carbonyl compounds which seemed to be responsible for the odour. Although apparently healthy tubers were examined, one of the distinctive components in the neutral fraction was identified as ipomeamarone. It was demonstrated that healthy tubers were in fact free of ipomeamarone, but that considerable amounts appeared in the steam distillate of sweet potatoes which were damaged, even slightly as if by scratching during transport or treatment. Other neutral compounds were identified as docosane, tricosane, sabinene, sabinene hydrate and a presumed phthalic compound by MS. Capric, lauric,

myristic, palmitic, stearic, oleic, linoleic and linolenic acids were found to be predominant components of the distillates from both portions. [From En summ.] IRF

76

Formation of free fatty acids during the ripening of fat modified cheese slurries.

Harper, W. J.; Kristoffersen, T.; Wang, J. Y. *Milchwissenschaft* 33 (10) 604-608 (1978) [14 ref. En, de] [Dep. of Food Sci. & Nutr., Ohio Agric. Res. & Development Cent., Columbus, Ohio, USA]

The effect of substituting various vegetable lipid systems for milk fat on the formation of free fatty acids (FFA) during the ripening of Cheddar and Romano cheese slurry systems was studied. Contrary to the generally accepted belief, low mol. wt. FFA were formed during the ripening process in cheese slurry systems in which the vegetable lipids did not contain any low mol. wt. FFA. The relative concn. of the low mol. wt. FFA (C4-C10), as well as the concn. produced relative to a full milk fat control system, varied as a function of the vegetable lipid and of the emulsifier utilized with it. In both Cheddar and Romano cheese slurries, $\leq 90\%$ as much FFA were formed in the slurries made with partially hydrogenated soybean oil or blends of soybean oil and cottonseed oil as were produced in the milk fat control system. Type of emulsifier used in a given lipid system had a definite effect on the ratios and relative concn. of low mol. wt. FFA. The greatest production of low mol. wt. FFA was observed with hardened rapeseed mono- and diglycerides and lactic acid ester, whereas utilization of Myverol 18-07, decaglycerol dioleate and propylene-glycol mono-oleate resulted in inhibition in the formation of low mol. wt. FFA in both Cheddar and Romano slurry systems.

AS

77

[Application of microbial enzyme preparations in cheese production. V. Study of volatile fatty acids of White pickled cheese manufactured with Mesenterin.]

Anwendung mikrobieller Enzympräparate in der Käseproduktion.

V. Untersuchung der flüchtigen Fettsäuren von mit Mesenterin hergestelltem Salzlakenkäse.

Obretenow[Obretenov], T.; Dimitroff[Dimitrov], D.; Obretenowa[Obretenova], M.

Milchwissenschaft 33 (9) 545-547 (1978) [17 ref. De, en] [Vissh Inst. po Khranitelna i Vkusova Promishlenost, Plovdiv, Bulgaria]

White pickled ewes' milk cheeses were made by the customary procedure using 'Mesenterin 11-11' enzyme preparation (EP) [See FSTA (1974) 6 5P741] isolated with acetone, or EP isolated with 70% $(\text{NH}_4)_2\text{SO}_4$, dialysed and precipitated with 96% ethanol, or 'Farmakhim' liquid rennet [see FSTA (1973) 5 2P229] as control. The cheeses were ripened for 90 days and examined after ripening for 1, 30 and 90 days; contents of volatile fatty acids were determined by GLC.

Proportions and contents of (i) acetic, (ii) propionic, (iii) iso-oleic, (iv) oleic, (v) isovaleric, (vi) valeric, (vii) caproic and (viii) caprylic acids are tabulated for all experimental variants. No appreciable differences were found between cheeses made with the 3 enzyme preparations studied. The proportion of (v)-(viii) acids was greater throughout than that of (i)-(iv) acids and

increased with the progress of ripening, (viii) reaching $\geq 60\%$ and (vi) and (v) $\leq 35\%$. The ratio (K) of (i) to (v)-(viii) is suggested as a measure of cheese quality. K values during ripening are graphically shown for (i)-(iii). SKK

78

Recognizing the proper compounds to get the most out of cheese flavor.

Kristoffersen, T.

Dairy and Ice Cream Field 161 (9) 8011-8017, 81-82 (1978) [En] [Dep. of Food Sci. & Nutr., Ohio State Univ., 190 North Oval Drive, Columbus, Ohio 43210, USA]

Factors affecting flavour in ripened cheeses (enzymes, microorganisms, animals that produced the milk, pasteurization, manufacturing process, ripening and the components responsible for the flavour are discussed. FL

79

Studies on the flavour of 'katsuobushi'. VII.

Identification of non-carbonyl neutrals.

Nishibori, K.; Kasahara, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 44 (4) 389-391 (1978) [8 ref. En] [Notre Dame Seishin Univ., Okayama, Japan]

Non-carbonyl neutral (NCN) volatiles in the aroma of 'katsuobushi' [dried meat of skipjack] were studied. The volatiles were prepared by steam distillation followed by ether extraction. The resulting aroma concentrate was fractionated by the usual solvation method. The NCN volatiles were isolated and purified by gas chromatography, and were identified by MS and IR analyses. 5 kinds of NCN components (furfuryl alcohol, 1,2-dimethoxybenzene, 4-methyl-1,2-dimethoxybenzene, (i) 1,2,3-trimethoxybenzene and (ii) dibenzofuran) and one phenolic component (iii) 2,3,5-trimethylphenol were identified and a NCN component (4-ethyl-1,2-dimethoxybenzene) was tentatively identified. (i), (ii) and (iii) have not previously been reported to be factors in 'katsuobushi' flavour. [See FSTA (1976) 8 9R523 for part VI.] AS

80

[Volatile components of 'kusaya'.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 44 (4) 385-387 (1978) [3 ref. Ja, en] [Notre Dame Seishin Univ., Okayama, Japan]

Volatile components of 'kusaya' [horse mackerel dried after soaking in special salt water, preserved for years] were studied by GLC and GC-MS analyses. 8 acids (acetic, propionic, isobutyric, n-butyric, isovaleric, n-valeric, isocaproic, and n-caproic), 3 bases (trimethylamine, dimethylamine or monomethylamine and NH_3) and 6 carbonyls (acetaldehyde, propionaldehyde, acetone, n-butyraldehyde, methyl ethyl ketone, and caproaldehyde) were identified. The aroma of 'kusaya' seems to be due to the volatile acids identified, especially to n-butyric acid. AS

volatile fatty acids as indicator of the quality of fish preserves.]

Adova, L. S.

Ybnoe Khozyaistvo No. 7, 65-67 (1978) [Ru]

Novosibirskii Inst. Sovetskoi Kooperativnoi Torgovli, Novosibirsk, USSR]

Composition of volatile fatty acids was investigated at various stages of maturing of fish preserves (Siberian coregonus). The material contained acetic, propionic and butyric acids; higher acids (isovaleric and caproic) appeared in the preserves during maturing. At the stage of overmaturing, when acid and pungent aroma develops, there was an increase of butyric acid. These acids are probably produced by deamination of the amino acids. The total vol. of the mentioned acids is not high, ranging between 2 and 7%, but their importance for aroma formation is vital. STI

82

Studies on flavour components in boiled crabs. I. Amino acids and related compounds in the extracts.

Konosu, S.; Yamaguchi, K.; Hayashi, T.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 44 (5) 505-510 (1978) [16 ref. En] [Tokyo Univ. of Fisheries, 4-5 Konan 7, Minato-ku, Tokyo, Japan]

In order to elucidate the flavour components characteristic of boiled crabs, a suitable method of extraction was examined and extracts were prepared from different edible parts of 5 spp. of crab. The amino acid composition of the extracts was analysed as the first step of a series of investigations on the flavour components. A common feature of the free amino acid composition of the leg meat extracts was a very high content of glycine and arginine, with somewhat lower amounts of proline and taurine; the former 2 comprised about 50% of the total free amino acids. In extracts of the hepatopancreas and ovary, the abundant amino acids were taurine, glycine, and arginine. After acid hydrolysis of the extracts, the total of free amino acids showed a 10-20% increase in the leg meat and the ovary and a 50-70% increase in the hepatopancreas. The main amino acids to increase were glutamic and aspartic acids. AS

83

[Changes in volatile fatty acids in roast pork with different heat processing methods.]

Rogov, I. A.; Deniskina, T. G.; Yasyreva, V. A.; Zharinov, A. I.

Miyasnaya Industriya SSSR No. 4, 40-41 (1978) [3 ref. Ru] [Moskovskii Tekh. Inst. Myasnoi i Molochnoi Promyshlennosti, Moscow, USSR]

It is anticipated that the use of new heat processing methods, especially those using electromagnetic fields of a very high frequency, will affect the content of volatile constituents in meat products. Changes in volatile fatty acids in roast pork were investigated. The meat was roasted using the conventional method or by microwave heating. Samples of meat were processed in a microwave oven (output 0.9 kW, cooking time 16 min) and in an electric oven. The samples were then cooled

and the content of volatile fatty acids was determined. Volatile fatty acids were isolated using vacuum distillation, and methyl esters were separated by gas chromatography. It was established that, in roast pork without lard, the content of the majority of volatile fatty acids was somewhat higher than in the initial raw material. Isovaleric and capric acids formed an exception. The content of volatile fatty acids in meat cooked in a microwave oven exceeded or was equal to that in conventionally-cooked samples. STI

84

[Flavour and aroma characteristics of natural extracts of black pepper.]

Kostrzewa, E.; Karwowska, K.

Prace Instytutów i Laboratoriów Badawczych Przemysłu Spożywczego 27 (2) 93-102 (1977) [38 ref. Pl, ru, en] [Inst. Przemysłu Fermentacyjnego, Warsaw, Poland]

A Polish extract of black pepper was compared with foreign preparations. Contents of piperin and volatile oils were determined and separation of components by gas chromatography was made. Liquid dichlorodifluormethane was used as extractant. The evaluation criteria were piperin and volatile oils content, and flavour and aroma of the product assessed organoleptically, and related to the basic raw materials. The Polish extract received relatively high rating. Parallel gas chromatographic studies of Polish extract volatile oils and of raw material volatile oil showed a considerable similarity of quality and peaks distribution. STI

85

[Analysis of the flavour of foods.] Aromastoff-Analytik in Lebensmitteln. [Review] Schreier, P.

Deutsche Lebensmittel-Rundschau 74 (9) 321-324 (1978) [53 ref. De, en, fr] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Aspects considered in this review include: analytical methods (covering isolation and extraction of flavour constituents, and separation and identification by GLC, MS, IR spectroscopy, NMR, etc.); sensory evaluation of the flavour and aroma characteristics of individual fractions separated by GLC; quantitative analysis of flavour compounds after selective enrichment (using orange flavour as an example); problems of formation of secondary flavour compounds as a result of e.g. enzymic activity during comminution of the sample; and analysis and legal evaluation of flavoured foods. AJDW

86

Formation of heterocyclic compounds from the reaction of cysteamine and D-glucose, acetaldehyde, or glyoxal.

Sakaguchi, M.; Shibamoto, T.

Journal of Agricultural and Food Chemistry 26 (5) 1179-1183 (1978) [36 ref. En] [Ogawa & Co. Ltd., 6-32-9 Akabanenishi, Kita-Ku, Tokyo, Japan]

The volatile compounds produced from the reaction of cysteamine and α -glucose, acetaldehyde, or glyoxal were extracted with methylene chloride using a liquid-liquid continuous extractor. GLC and MS methods were used to identify 24 compounds. The compounds identified were mainly heterocyclic compounds including pyrazines, thiazoles, thiazolines, and thiazolidines. N-methylthiazolidine was identified by NMR spectra in addition to the GLC-MS method. Most compounds identified in these model systems have previously been found in foods. Thiazolidines, which are reduced products of thiazoles and thiazolines, have not, however, been found in foods. The formation pathways of these heterocyclic compounds are also discussed. AS

87

Identification of a thiamin odor compound from photolysis of thiamin.

Seifert, R. M.; Buttery, R. G.; Lundin, R. W.; Haddon, W. F.; Benson, M.

Journal of Agricultural and Food Chemistry 26 (5) 1173-1176 (1978) [10 ref. En] [W. Regional Res. Cent., USDA, Albany, California 94710, USA]

The probable identity of a new compound, 1-methylbicyclo[3.3.0]-2,4-dithia-8-oxaoctane, with the characteristic odour of thiamin is reported. It is formed by UV irradiation (253.7 nm) of thiamin.HCl. Its identity was arrived at by combinations of MS, IR spectrometry, Raman spectrometry, UV spectrometry, proton magnetic resonance, ^{13}C NMR, and some chemical tests. AS

88

Formation of sulfur-containing compounds from the reaction of D-glucose and hydrogen sulfide.

Sakaguchi, M.; Shibamoto, T.

Journal of Agricultural and Food Chemistry 26 (5) 1260-1262 (1978) [38 ref. En] [Ogawa & Co. Ltd., 6-32-9 Akabanenishi, Kitaku, Tokyo, Japan]

39 compounds produced from the reaction of D-glucose with H_2S in aqueous solution were identified by a GLC-MS technique. The major volatiles obtained from this reaction system were sugar degradation products and S-containing heterocyclic compounds. Most compounds identified were found in foods and some of them give characteristic odours to particular foods. The formation of flavour compounds in this system indicates that sugar and H_2S may be precursors of cooked food flavours. Compounds identified, their odour description and reported occurrence in foods are tabulated. AS

89

[Effect of wort boiling and treatment on the dimethyl sulphide content of wort and beer.] Der Einfluss des Würzekochens und der Würzebehandlung auf den DMS-Gehalt in Würze und Bier.

Nakajima, S.; Narziss, I.

Brauwissenschaft 31 (9) 251-259 (1978) [17 ref. De, en, fr] [Lab. für Tech. der Brauerei I, Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Studies were conducted at 2 breweries to evaluate effects of wort boiling and subsequent wort treatment on levels of dimethyl sulphide (DMS) and other compounds. DMS concn. decreased during wort boiling more being driven off than was formed during subsequent processing. After boiling, the DMS concn. increased significantly. Max. formation of DMS during fermentation increased with increased time of holding the wort hot. Decreases in DMS concn. during maturation of the beer varied considerably; DMS concn. in the wort was a major factor determining its level in the beer. Conc. of methionol and the 3-(methylthiopropyl) ester of acetic acid were unaffected by wort boiling, etc. Variations in this concn. during fermentation differed between the 2 breweries. No correlation was observed between a sulphury/yeasty flavour and concn. of S compounds in beer. Only hot centrifuged worts were found to impart this flavour. TUB-IGB

90

[New trends in the technology of Tokay wines.]

Kasa, A.

Vinohrad 16 (1) 16-17 (1978) [Sk] [Pol'nohospodarské Odborne Uceliste, Vinicky, Czechoslovakia]

The technology of production of wines of the Tokay type is very demanding on storage space, labour and materials. Ageing of these wines occurs in presence of Rhacodium cellare, involving oxidation-reduction and esterification processes and formation of numerous aldehydes, acetals and other flavour compounds. Certain Tokay wines were shown to contain 247 flavour compounds. The grape var. suitable for production of Tokay wines are Furmint, Lipovina and Zlutý Muskat, and the new var. Muskat Ottonel and Cervený Tramin are also considered promising. Development and ageing as well as fungistatic effect of stabilizers may be significantly improved by effective filtration and combined clarification. STI

91

Isolation and identification of volatiles from Catawba wine.

Nelson, R. R.; Acree, T. E.; Butts, R. M.

Journal of Agricultural and Food Chemistry 26 (5) 1188-1190 (1978) [15 ref. En] [Dep. of Food Sci. & Tech., New York State Agric. Exp. Sta., Geneva, New York 14456, USA]

The volatile composition of 3 Catawba wines prepared from grapes grown in the vineyards of the New York State Agricultural Experiment Station during the 1976 vintage were analysed by instrumental and sensory means. The 3 wines differed according to the oenological technique employed for their production. Volatiles were isolated by solvent extraction, separated and quantified by GLC, and identified by combined GLC-MS. Although some variation in volatile composition due to processing technique was observed, sensory analyses comparing the wines with corresponding model solutions indicated that the major identifiable components are of little importance in determining the aroma of Catawba wine as influenced by processing technique. AS

2

behaviour of some volatile compounds during storage of orange juice powder with low and intermediate moisture contents.

Panico laou, D.; Rigaud, J.; Sauvageot, F.; Dubois, P.; Matos, D.

Journal of Food Technology 13 (6) 511-519 (1978)

4 ref. En] [Tech. Inst. of Plant Products, Lykovrissi, Maroussion, Athens, Greece]

The changes in flavour of orange juice powder at low and intermediate moisture contents were studied by sensory analysis, as a function of time and temp. (27-30°C). The development of some volatile components was studied by gas chromatography. The volatiles that show the most significant increase when a change in flavour becomes detectable by the taste-testing panel are furfural and diacetyl, especially in products with low moisture contents (2-15% water content). In products with higher water contents (20-40%), the concn. of these 2 volatiles exhibit a smaller increase, but the increase in the amounts of α -terpineol and 3-methyl-2-buten-1-ol contents become more important. It is suggested that under these experimental conditions, the origin of diacetyl may be oxidation of acetoin. AS

13

Recovery of volatile aroma compounds during evaporation of fruit juices. (In 'Quelques problèmes intéressants les industries agricoles et alimentaires en zone méditerranéenne' [see FSTA (1979) 11 5G345].) [Lecture]

Saravacos, G.

pp. 659-664 (Undated) [10 ref. En, de, fr]

Studies were conducted on recovery of volatile aroma compounds during concn. of McIntosh apple juice and Concord grape juice in a falling-film evaporator, and on stripping of ethanol during evaporation of a model ethanol/sucrose solution in a laboratory agitated-film evaporator. Graphs of results are given. >90% of the volatile esters were stripped from apple juice during evaporation-off of approx. 15% of the water; evaporation of 35% of the water was necessary for stripping of only 80% of the volatile esters in grape juice. Studies on the 10% sucrose solution containing 500 p.p.m. ethanol showed that 50% of the ethanol was stripped during evaporation of approx. 13% of the water; 90% was stripped during evaporation of approx. 35% of the water. The practical significance of these results is discussed, with special reference to the observation that retention of volatiles tends to increase with increasing sugar concn. AJDW

94

[Behaviour of volatile compounds during freeze-drying of fruit juices.] (In 'Quelques problèmes intéressants les industries agricoles et alimentaires en zone méditerranéenne' [see FSTA (1979) 11 5G345].) [Lecture]

Pallotta, U.; Lerici, C. R.

pp. 665-686 (Undated) [32 ref. Fr, en, de] [Inst. for the Agric. Ind., Univ. of Bologna, Bologna, Italy]

GLC studies on the behaviour of volatile compounds during freezing and freeze-drying of apple, pear, peach

and apricot juices are described. Aspects considered include: migration of volatiles during directional freezing in sealed and non-sealed containers; losses of volatiles during the freezing process before complete solidification; kinetics of losses of volatiles during freeze-drying; and retention of volatiles in the freeze-dried products. Numerous chromatograms are illustrated. The results show that behaviour of the volatiles during freeze-drying is dependent on their chemical nature, freezing and freeze-drying conditions, and the concn. and nature of the non-volatile material. Losses of volatiles occur mainly during sublimation of water. Freezing conditions are of especial significance for the behaviour of the volatiles. AJDW

95

[Occurrence of volatile phenols during the kilning of malt.] Über das Auftreten von flüchtigen Phenolen beim Darren von Malzen. [Lecture]

Kieninger, H.; Boeck, D.; Schwankl, M.

Proceedings, European Brewery Convention 16th Congress, 129-137 (1977) [1 ref. De, en, fr]

[Wissenschaftliche Sta. für Brauerei in München, Munich, Federal Republic of Germany]

Occasionally an off-flavour is found in beers which is described as smoky or apothecary-like. It has been observed that these beers have a higher than usual content of low steam-volatile phenols. These substances can pass into the beer being derived either from the brewing liquor or the malt. Since in breweries the liquor used is generally carefully controlled both with respect to odour and taste, it is assumed that the source from the malt plays the greater rôle. During investigation of 104 malt samples from different maltings, it was found that malt from indirectly heated kilns contained 0.05-0.30 mg/kg of steam-volatile phenols whilst in those from directly fired kilns contents of 0.20 mg/kg were noted. The development of steam-volatile phenols during the kilning process was investigated in 3 maltings with different kilning installations. In a directly-fired kiln an increase in the steam-volatile phenols was found initially then a decrease was observed whereas in an indirectly heated kiln the value first remained constant before a decrease was later found. The introduction of an exhaust gas filter in a directly heated kiln was not able to prevent the increase in content of steam-volatile phenols in the initial phase but only reduced it. [See FSTA (1979) 11 5H707.] AS

96

[Effect of oxygen uptake during transfer on the secondary fermentation and on beer quality.] Einfluss der Sauerstoffaufnahme beim Schlauchen auf die Nachgärung und Bierqualität. [Lecture]

Sommer, G.; Schilfarth, H.; Krüger, E.; Knoop, R.

Proceedings, European Brewery Convention 16th Congress, 577-589 (1977) [10 ref. De, en, fr] [Versuchs- und Lehranstalt für Brauerei, Berlin]

This investigation aims to show the effect that systematic aeration (5, 10 and 20 mg O₂/l.) of beer at transfer has on secondary fermentation, the formation of by-products of fermentation and beer quality. Results revealed that O₂ passed into the transferred beer was

very rapidly taken up by the yeast in about 2-8 days. Aeration of the transferred beer resulted initially in increased production of acetaldehyde, although during the course of 32 days maturation there was very great assimilation of this compound. In addition, the contents of α -acetolactate and diacetyl were initially somewhat increased in the aerated tank beer although their reduction during maturation was normal. The content of O_2 in the transferred beer had no effect on the formation of esters or on the content of higher aliphatic alcohols in the beer. The content of volatile sulphur compounds in the filled beer was in the average range in all trials. Only the content of dimethylsulphide appeared to be affected to a certain extent by the O_2 content of the transferred beer. All remaining analytical data varied within the normal limits of error. Tasting of the freshly filled beers revealed no significant difference in any case. Beers aerated during transfer were evaluated more favourably in some cases in the flavour stability tests. [See FSTA (1979) 11 5H707.] AS

97

Relations between fermentation temperature and the formation of some flavour components. [Lecture] Engan, S.; Aubert, O.

Proceedings, European Brewery Convention 16th Congress, 591-607 (1977) [31 ref. En, de, fr] [A/S Hansa Bryggeri, Bergen, Norway]

One of the more important factors influencing the formation of flavour components in beer is the fermentation temp. The formation of acetaldehyde, higher alcohols (1-propanol, isobutanol, amylalcohols and 2-phenylethanol), esters (ethyl acetate, isoamyl acetate, 2-phenylethyl acetate, ethyl hexanoate and ethyl octanoate) and some fatty acids (hexanoic, octanoic and decanoic acid) was followed during fermentations at 8°, 10° and 12° C in a number of full scale trials (30 000 l.) as well as in parallel laboratory trials (3 l.). At each temp. 4 subsequent trials were carried out. The yeast was recovered in each case and pitched again in the following trial. The trials were performed in 2 different breweries and each brewery used its own selected yeast strain. In most cases the trials tended to confirm the assumption that higher fermentation temp. will stimulate the formation of higher alcohols and esters, but the influence of temp. appeared to differ from 1 flavour component to another, and it also depended on the temp. interval investigated. Other factors as well, like yeast strain, wort composition and fermentation conditions (small scale, full scale) may influence the temp. effect. Thus, it appears that general rules for the relationships between fermentation temp. and the formation of these flavour components cannot be given. [See FSTA (1979) 11 5H707.] AS

98

[Effect of maturation parameters on the aroma components and the composition of beer.] Der Einfluss der Reifungsparameter auf die Aromakomponenten und die Zusammensetzung des Bieres [Lecture]

Miedaner, H.; Nakajima, S.; Narziss, L.

Proceedings, European Brewery Convention 16th

Congress, 609-621 (1977) [22 ref. De, en, fr] [Lehrstuhl für Tech. der Brauerei I, Weihenstephan Federal Republic of Germany]

Brewing trials were carried out in several beer samples in which the main part or even the whole extract was fermented at normal temp. between 8.5° and 9.5° C without the use of pressure. Maturation was subsequently carried out at temp. between 8.5° and 20° C. Degradation of 2-acetolactate to a level < 0.15 mg/l was used as an indicator of the progress of maturation. Depending on the method used, the amount of time spent on fermentation and maturation was reduced to 7-10 days. Following a 7 day stabilization phase, the total production time was 14-17 days. The effects of different procedures on the general criteria of clarity and flavour of beer and on the content of several important aroma components are discussed. By careful attention to the various conditions and methods of operation, e.g. by prompt separation of yeast, it proved possible to prepare an equivalent product to the particular type of conventionally-produced control beer. [See FSTA (1979) 11 5H707.] AS

99

Gas chromatographic-mass spectrometric investigation of volatile components of hops, worts and beer and their formation. III. Nitrogen-containing aroma compounds in malt and beer. Gaschromatographisch-massenspektrometrische Untersuchungen flüchtiger Inhaltsstoffe von Hopfen, Würze und Bier und deren Genese. III. Stickstoffhaltige Aromastoffe in Malz und Bier. [Lecture]

Tressl, R.; Renner, R.; Kossa, T.; Köppler, H.

Proceedings, European Brewery Convention 16th Congress, 693-707 (1977) [24 ref. De, en, fr] [Forschungsinstit. für Chem.-Tech. Analyse der Versuchs- & Lehranstalt für Brauerei, Berlin]

By means of a special separation process involving liquid-liquid extraction, adsorption chromatography, gas chromatography and MS, 40 new N-containing aroma components were identified and quantified according to size in dark malt and dark beer. The groups of compounds concerned are pyrazines, pyrroles and thiazoles, which are formed via the Maillard reaction and nicotinic acid esters and acylated amines which result from the metabolism of yeast. Many of the compounds characterised for the first time possess typical aroma notes and have low sensory threshold values. On account of these properties they make a significant contribution to the basic flavour of beer, provide the typical aroma of certain types of beer and at higher concn. can cause flavour defects. The origin, analysis and quantitative distribution of these new beer aroma compounds are tabulated and discussed. [See FSTA (1979) 11 5H707.] [See FSTA (1979) 11 3H443 for part II.] AS

100

Major volatile components of Aurore wine: a gas chromatographic-mass spectrometric analysis combining chemical ionization and electron impact ionization.

Cobb, C. S.; Bursey, M. M.; Rice, A. C.

Journal of Food Science 43 (6) 1822-1825 (1978) [22

En][Union Carbide Corp., Bound Brook, New Jersey 08805, USA]

A GLC-MS study of volatiles in the total extract of the fruit from *Vitis vinifera* var. Aurore using both chemical ionization and electron ionization for ion product allowed identification of 26 components, 6 of which had not been previously reported in wines; viz. heptanol, ethyl 4-hydroxypentanoate, ethyl 4-phenyl-3-pentenoate, 2-hydroxypropyl butanoate, N-ethylacetamide and diethyl 2-hydroxyglutarate. IFT

101

Constituents of the headspace gas from udo (*Aralia nudicaulis* Thunb.).]

Ogata, T.; Tsukiji, K.; Odagiri, S.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 52 (5) 223-224 (1978) [5 ref. Ja, en] [Dep. of Agric. Chem., Iwate Univ., Morioka, Japan]

The headspace volatiles elaborated by wild and cultivated udo [an edible stem vegetable plant resembling rhubarb] were analysed by GLC-MS, and identities of individual constituents were confirmed by IR and UV spectrometry of essential oil components. The following compounds were positively or tentatively identified: α -pinene, camphene, β -pinene, sabinene, β -caryophyllene, myrcene, α -limonene, ocimene, and p-cymene.

The headspace gas of wild udo contained 3 times the amount of volatiles found in cultivated udo. α -pinene was the major volatile component, accounting for 60% and 90% in volatiles of cultivated and wild udo, resp.; and α -pinene flavour showed organoleptic similarity to that of udo, demonstrating its importance in contributing to the flavour of the food. [From En summary.] JRR

102

Volatile components and pungency in fresh and processed jalapeno peppers.

Huffman, V. L.; Schadle, E. R.; Villalon, B.; Burns, E. E. *Journal of Food Science* 43 (6) 1809-1811 (1978) [21 ref. En] [Dep. of Hort. Sci., Texas A & M Univ., College Station, Texas 77843, USA]

The flavour of fresh jalapeno peppers was defined and quantified by means of combined gas chromatography-MS. The cv. J100 was utilized. Jalapeno flavour was attributed to 2-isobutyl-3-methoxypyrazine. The compound is distributed unevenly throughout the pepper pod. Values ranged from 0 in the seed to 88.33 ng/g in the outer wall in a dry wt. basis. Thermal processing leads to an altered or cooked flavour. Capsaicin, the compound responsible for the heat, is also unevenly distributed in the pod. Gas chromatographic analysis of fresh pepper parts revealed values ranging from 0.21 mg/100 g in the outer wall to 18.37 mg/100 g in the pod cross walls. All portions of the pepper are perceived as hot after thermal processing. However, capsaicin remains concentrated in the cross wall region. Microscopic examination of the pepper tissue revealed no specialized structure housing either the flavour or heat components. These are considered to be normal metabolites of the fruit and found as an integral part of the plant cells. IFT

103

Effect of enzyme treatment of apple pulp with a commercial pectinase and cellulase on the volatiles of the juice.

Schreier, P.; Drawert, F.; Steiger, G.; Mick, W.

Journal of Food Science 43 (6) 1797-1800 (1978)

[29 ref. En] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

The influence of a commercial pectolytic and cellulolytic enzyme preparation on the neutral volatile constituents of apple juice was investigated by GLC and coupled GLC-MS. It could be demonstrated by quantitative detn. of aroma substances of apples (Fünffjahresplan, Jonathan) and apple juices that the enzyme treatment of apple pulp especially influenced the formation and distribution of C6-aroma compounds in the juices. The enzyme treatment with a pectolytic preparation led to the preservation of C6-aldehydes, whereas after application of a cellulolytic enzyme strong reduction of C6-aldehydes to the corresponding alcohols was observed. Using reaction times of 90 min for the enzymic treatment, decreases in the amounts of genuine fruit esters could not be detected. Only after pulp treatment with a combined pectolytic and cellulolytic preparation for ≥ 26 h was considerable hydrolysis of fruit esters noticed. IFT

104

[Method for gas chromatographic determination of flavour-change in cocoa- and chocolate mass.]

Methode zur gaschromatographischen Untersuchung der Aromaveränderungen von Kakao- und Schokoladenmasse.

Valdeig, K.

Nahrung 22 (8) 745-748 (1978) [12 ref. De, en, ru] [VEB Forschung & Rationalisierung für die Süß- & Dauerbackwarenind., Leipzig, German Democratic Republic]

A headspace GLC method for detn. of the main volatile compounds in cocoa products is described, based on placing a 100 ml sample of the substance under test in a 120 ml blood bottle, sealed with the rubber cap provided, holding in a water bath at 95°C for a suitable time (15 min for a sample at an initial temp. of 60°C, 90 min for an initially-solid sample), collection of a headspace sample using an injection syringe, and analysis by GLC on a Cekachrom 3 styrene/divinylbenzene copolymerizate column, with flame ionization detection. Reproducibility was good. Studies on various cocoa- and chocolate samples showed significant differences between the isobutanol and isopentanol contents of the samples; these differences in aldehyde content were significantly correlated with differences in organoleptic properties. AJDW

105

Classification of sweet corn aromas by stepwise discriminant analysis.

Flora, L. F.; Wiley, R. C.; Moon, L. C.

Journal of Food Quality 1 (4) 341-348 (1978) [10 ref. En]

[Food Sci. Program, Dep. of Hort., Univ. of Maryland, College Park, Maryland 20742, USA]

Cooked sweet corn aroma volatiles were analysed by gas chromatography using a headspace technique. Aroma profiles of corn from early and late plantings, different stages of maturity, different cv., and different processes were submitted to stepwise discriminant analysis (BMD-07M). Processes were most often classified correctly with slight overlaps between brine-pack canned corn and vacuum-packed canned corn and more notable overlapping between frozen and vacuum frozen corn. Corn samples from different plantings were classified correctly about 2/3 of the time on the basis of their aroma profiles. Stylepak and NK199 cv. were most often classified correctly; similarities expressed in overlapping classifications were apparent among Buttersweet, Silver Queen and NK199 and among Code 556, Buttersweet and Silver Queen. Fancy grade corn was correctly classified about 45% of the time, extra standard about 67% of the time, and standard about 68% of the time. By stratifying the data by processing method prior to discriminant analysis, improved classification was achieved for cv. and maturities. AS

106

Instrumental analysis of volatiles from rice and corn products. [Lecture]
Legendre, M. G.; Dupuy, H. P.; Ory, R. L.; McIlrath, W. O.

Journal of Agricultural and Food Chemistry 26 (5) 1035-1038 (1978) [15 ref. En] [S. Regional Res. Cent., USDA, New Orleans, Louisiana 70179, USA]

Profiles of volatiles of whole rice, brown rice, polished rice, rice bran, rice breakfast cereal, whole corn, and corn breakfast cereal were obtained by direct gas chromatography without prior enrichment of volatiles. Some of the volatiles were identified by combined GLC-MS. Methanol, acetaldehyde, ethanol, acetone, pentanal, hexanal, and hexanol were found in volatiles of whole rice, brown rice, polished rice, rice bran, and whole corn. In addition, 2-methylpropanal, 2-methylpyrazine, furfural, 2,5-dimethylpyrazine, benzaldehyde, and 2,6-dibutyl-4-methylphenol were found in rice and corn breakfast cereals. This unconventional GLC technique in combination with MS should provide a rapid means of analysing volatiles that might impart desirable flavour or undesirable off-flavour in new cv. and in raw and processed cereal products, before and after storage. Even at this early stage of development, the methodology is being used by industry to monitor raw materials. [See FSTA (1979) 11 5J628 and also (1977) 9 8M1003.] AS

107

[Use of instrumental techniques for analysis of the taste and odour constituents of rapeseed oil.]

Kurucz, E.; Prepostffy, M.; Jeranek, M.
Olaj Szappan Kozmetika 27 (2) 45-48 (1978) [13 ref. Hu, ru, de]

3 analytical methods are described: spectrophotometric detn. of total carbonyls (the carbonyl index being suitable for comparing refined rapeseed oils of varying quality); spectrophotometric detn. of volatile carbonyls (suitable for comparison of raw and refined oils); and gas chromatographic detn. of volatile carbonyls (suitable for analysis of refined and

stored oils, or for a more detailed breakdown of the carbonyl compounds). [From Ru summ.] HBr

108

[Use of gas-liquid chromatography for evaluation of specific aroma of milk products.]

Berezovskaya, A. A.; Shmeleva, L. I.

Molochnaya Promyshlennost' No. 9, 18-20, 47 (1978) [5 ref. Ru] [Leningradskoe Ordena Lenina Proizvodstvennoe Ob'edinenie Molochnoi Promyshlennosti, Leningrad, USSR]

Volatile aroma substances of pasteurized milk and cream, sterilized milk, ryazhenka, acidophilin, prostokvasha and kefir were examined by GLC using the head-space procedure of Palo et al. [FSTA (1979) 2 4P532]. Chromatograms are presented and it is concluded that acetaldehyde, ethanol and diacetyl were among the volatile aroma substances of the products examined; that their relative proportions determined the specific aroma of a product; and that GLC may be used in quality evaluation of various milk products. SKK

109

The potential roles of plasmid deoxyribonucleic acid in *Streptococcus lactis*, subsp. *diacetylactis*.

Kempler, G. M.; Larsen, L. D.; McKay, L. L.

Abstracts of the Annual Meeting of the American Society for Microbiology 78, 191 (1978) [En] [Univ. of Minnesota, St Paul, Minnesota, USA]

The ability to utilize citrate and to metabolize lactose are unstable properties in *Streptococcus lactis* subsp. *diacetylactis* (SLD) 18-16 and DRC-1; therefore, the linkage of these traits to plasmid DNA was examined. CsCl-ethidium bromide equilibrium density gradients of cleared lysate material from each strain revealed the presence of a satellite peak characteristic of covalently closed circular (CCC) DNA. Samples of the CCC DNA were subjected to agarose gel electrophoresis to determine the plasmid composition of each strain. Relative mobility curves, using *Escherichia coli* plasmid DNA as standards, were used to establish the mol. wt. of the individual plasmid spp. SLD 18-16 was found to possess 6 plasmids having mol. wt. of 34, 25, 6.6, 5.2, 3.6 and 3.1 Mdalton. SLD DRC-1 contained 6 plasmids of mol. wt. 34, 27, 14, 5.2, 4.6 and 3.5 Mdalton. Variants of SLD 18-16 which failed to produce acetoin plus diacetyl from citrate (Cit⁻) were found to be missing the 5.2 Mdalton plasmid. Lactose-negative (Lac⁻) Cit⁻ mutants from the same strain were devoid of both the 5.2 and 34 Mdalton plasmids. Lac⁻ mutants of SLD DRC-1 were also found to be missing a 34 Mdalton plasmid. These results suggest that citrate utilization and lactose metabolism may be plasmid mediated in SLD 18-16 and DRC-1. AS

110

[Meat aroma. I. Attempts to concentrate aroma substances from natural meat for gas chromatographic analysis.] *Fleischaroma. I. Versuche zur Anreicherung von Aromastoffen des natürlichen*

Fleisches für die gaschromatographische Analyse. Rödel, W.

Nahrung 22 (8) 721-728 (1978) [17 ref. De, en, ru]

Zentralinst. für Ernährung, Potsdam-Rehbrücke,
German Democratic Republic]

Comparative studies on isolation and concn. of aroma substances from boiled and roasted beef are described. Isolation by distillation, or extraction (e.g. with di-n-butyl phthalate) led to aroma changes. The best results were achieved by collection of the aroma compounds in a cooled glass column filled with a suitable carrier (e.g. Gas-Chrom-Q, 80-100 mesh, with 10% Carbowax M), immediately followed by GLC-analysis. [See also following abstr.] IN

11

Meat aroma. II. Characterization of meat aroma.]
Leischaroma. II. Beitrag zur Charakterisierung des
Leischaromas.
Födel, W.

Ernährung 22 (8) 729-734 (1978) [9 ref. De, en, ru]
Zentralinst. für Ernährung, Potsdam-Rehbrücke,
German Democratic Republic]

Aroma substances in roast beef were analysed by GLC, with use of a splitter to permit simultaneous recording of peaks by means of a flame ion detector, and organoleptic evaluation of the aroma compounds. Chromatograms are given of aroma compounds isolated under vacuum, N₂-flushing and capture on di-n-butyl phthalate, or by collection on a carrier-filled glass column; characteristics of these chromatograms are discussed. No fractions possessing the characteristic meaty smell were observed; it is therefore concluded that the aroma of roast beef is attributable to a complex interaction of flavour compounds. [See also preceding abstr.] AJDW

112

Studies on constituents of essential oil from
Zingiber officinale Roscoe. I. Constituents of
essential oil from rhizomes.]

Sakamura, F.; Hayashi, S.
Journal of the Agricultural Chemical Society of
Japan [Nihon Nogei Kagakkai-shi] 52 (5) 207-211
(1978) [17 ref. Ja, en] [Oshimo Women's Junior Coll.,
Japan]

In order to clarify the natural aroma of rhizomes of ginger, constituents of essential oils obtained by steam distillation were analysed by one or more of the following techniques: gas chromatography, MS, IR spectroscopy and NMR. The rhizomes used were fresh (shinshoga), seed rhizomes stored for 5 or 8 months after harvest (taneshoga) and rhizomes a year old (oyashoga). The oil from all 3 groups consisted largely of monoterpenoids (particularly oxygenated compounds) with a small percentage of sesquiterpenoids. 19 compounds (from 35 which produced chromatogram peaks) were identified, including mono- and sesquiterpenoids. Of these, geranyl acetate (the major constituent), Δ^3 -carene, α -terpinene, α -terpineol and nerol have not been identified previously. The oil from shinshoga consisted mainly of 1,8-cineole (4.1-10.1%), neral (8.1-13.3%), geranial (12.7-21.8%), geraniol (12.1-23.0%), geranyl acetate (5.9-29.4%) and zingiberene (1.8-11.1%). The oils from the other 2 classes of rhizome contained markedly less geraniol and geranyl acetate, and more neral and geranial, than shinshoga. [From En summ. and tables.] JRR

113

[Interaction between flavouring substances and food components I. Behaviour of citral in mixtures of food components and water.] Wechselwirkungen zwischen Aromastoffen und Lebensmitteln. I. Das Verhalten von Citral in Mischungen von Lebensmittelkomponenten und Wasser.

Friedrich, H.; Gubler, B. A.

Lebensmittel-Wissenschaft und -Technologie 11 (4) 215-218 (1978) [5 ref. De, en] [Givaudan SA, 8600 Dübendorf bei Zürich, Switzerland]

An analytical method was found for determining citral content that could be reliably correlated with the findings of a trained sensory panel. This comprised extraction using organic solvent and centrifugation and analysing the dried organic layer by UV spectroscopy. The concn. exerted relatively little or no effect on accuracy of determination. This method and sensory detn. were used in investigations in which citral was added to aqueous solutions, suspensions or emulsions of various food components (sucrose, maltodextrin, saturated and unsaturated oils, casein, soy isolate, lactose, butterfat) or to water alone, and these were tested for citral following heat treatment (80-180° C) or after periods of storage at 4° or 45° C. The effects of pH and of nitrogen addition were also tested. Up to 75 and 33% of the citral content was registered at 80° and 120° resp., in oils but none at 180°, and up to 51 and 22% in carbohydrates and proteins, resp., at 80° C but up to only 18 and 14% at 120° C. During storage at 4° C citral disappeared most rapidly in casein and rapidly also in water, but rather more slowly in saccharides and butterfat (to about 10-20% after 70-80 days); in soy isolate, citral at first disappeared quickly, but later more slowly. Stability during storage appeared to be increased by addition of nitrogen and reduced by low pH. MJD

114

[Aroma and flavour substances in foods.] Aroma- und Geschmacksstoffe in Lebensmitteln.

Franzke, C.

Lebensmittel-Industrie 25 (6) 244-248 (1978) [17 ref. De, en, fr, ru] [Sektion Chem., Bereich Lebensmittelchem., Humboldt-Univ., Berlin]

After definition of some basic terms of importance in studies on sensory properties of foods, the current situation in relation to the classification, origin, formation and significance of aroma and flavour compounds in foods is discussed on the basis of literature data. IN

115

Volatile nitrosamines in some traditional southern Chinese food products.

Huang, D. P.; Ho, J. H. C.

Journal of Food Safety 1 (1) 1-6 (1977) [17 ref. En] [Med. & Health Dep., Inst. of Radiology & Oncology, Queen Elizabeth Hospital, Kowloon, Hong Kong]

The results of an analysis by combined gas chromatography and high resolution MS of 6 types of salted fish, pork sausage, goose-liver sausage, salt-dried beans, soybean paste, soy, shrimp paste, oyster sauce, soybean curd, salt-dried egg yolk and fish sauce for the

presence of volatile nitrosamines are reported. Extracts of the foods were examined for the following nitrosamines: N-nitroso-dimethylamine (NDMA); -diethylamine; -dipropylamine; -dibutylamine; -piperidine; and -pyrrolidine. Only NDMA was detected; it was found in 8 out of 19 samples of salted fish. There was no evidence for the natural presence of N-nitrosodiethylamine or any of the other nitrosamines listed above. For those samples of fish where positive results were obtained the levels were no higher than those encountered in cured meats consumed in Europe. However, the possibility of interaction between nitrosamine precursors during cooking or ingestion is being examined. SP

116

[Use of gas chromatography to analyse cellular metabolites.]

Paca, J.; Unger, P.; Voznakova, Z.

Kvasny Prumysl 24 (9) 208-210 (1978) [40 ref. Cs, ru, en, de] [VSCHT, Katedra Kvasne Chem. a Tech., Prague, Czechoslovakia]

A gas chromatographic method of direct detn. of ethanol and volatile fatty acids, in aqueous cultivation medium is described; Chromosorb WAW with Hallcomide M 18 and 1% H_3PO_4 were used for the separation. *Candida utilis* strain 136 was used in the experiments. STI

117

[Some experience with gas chromatography in distilleries.]

Vavrova, A.

Kvasny Prumysl 24 (7) 156-157 (1978) [5 ref. Cs, ru, en, de] [Vyzkumny Ustav Baleni Potravin, GR KOLI, Prague, Czechoslovakia]

The Chrom III gas chromatography method was modified to process alcohol and distillery fractions and to determine aromatic substances in brandies and fruit distilled drinks. The modification lies in re-arranging the filling column, detector resolving power and separation system. Experimentally found parameters are presented. STI

118

[Coffee processing: chemical, physical and technological aspects. I. Changes in some chemical and physical characteristics.]

Lerici, C. R.; Lercker, G.; Pepe, M.; Matassa, P.; Rosa, M. dalla

Industria delle Bevande 7 (5) 345-351 (1978) [20 ref. It] [Istituto di Industrie Agrarie (Tecnologie Alimentari), Univ. di Bologna, Bologna, Italy]

A sample of Arabica coffee from Brazil roasted industrially was extracted in the laboratory in a 'Gaggia' machine by the 'espresso' method, and the extract was either (i) freeze-dried in a model BVF 8/ARB B. Basi apparatus or (ii) spray-dried in a Minor model Niro Atomizer. Data on moisture, crude protein ($N \times 6.25$) total lipids, ash and extractives (by difference) and substances soluble in 80% ethanol (SE) are tabulated for raw and roasted coffee, and (i) and (ii) extracts resp. A balance sheet is presented showing that about 30% of protein, 1% of lipids, 75% of ash, 20% of extractives

and the whole of SE passed into the extract. SE of the above mentioned coffees and extracts and volatile components of extracts of under-roasted, roasted optimally or over-roasted Robusta coffee from the Ivory Coast and of an uncharacterized coffee mixture were examined by GLC. Chromatograms and data on peak areas are presented and discussed from the viewpoint of processing changes. SKK

119

The flavour constituents of gin.

Clutton, D. W.; Evans, M. B.

Journal of Chromatography 167, 409-419 (1978) [29 ref. En] [Int. Distillers & Vintners Ltd., Vintner House, River Way, Harlow CM20 1DX, UK]

London Dry Gin is distilled from ethanol and botanical ingredients (including juniper berries, and often coriander seeds) which impart the characteristic flavour. Methods for the analysis of the flavour volatiles present in London Dry Gin have been developed. The feasibility of direct analysis was tested by examination of 5 different gins using flavour profile testing, UV spectroscopy and GLC. The direct analysis of gin by gas chromatography was shown to provide very limited information. Experiments on the isolation of the flavour volatiles of gin, using a model system termed 'syn-gin', showed that the best methods were (i) solvent (shaker) extraction with dichloromethane and (ii) continuous extraction using Freon 11. These techniques were applied to commercial samples of gin, and method (ii) was found to yield representative flavour concentrates, suitable for analysis by gas chromatography-MS. The principal flavour volatiles are identified. Analysis of a wide range of gin samples showed that as a general rule a good quality gin should contain approx. as much γ -muurolene as p-terpineol; where the latter predominates, quality is normally poor. AL

120

[Biometrical evaluation of gas chromatographic data for differentiation of brandies.]

Schreier, P.; Reiner, L.

Industria delle Bevande 7 (6) 467-470 (1978) [29 ref. It, en] [Inst. für Lebensmitteltech., Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

See FSTA (1978) 10 5H597 for original De version.

121

[Fruit cake as a source of aromatic substances.]

Ichas, H.; Karwowska, K.; Kulesza, J.

Przemysl Fermentacyjny i Rolny 22 (2) 13-14 (1978) [22 ref. Pl] [Politech. Lodzka, Lodz, Poland]

Blackcurrants, raspberries and blackberries were processed by distillation-absorption, and the aromatic components of the juice and press cake were determined by gas chromatography. The juice and press cake condensates contained almost identical types and amounts of substances. A gas chromatographic study produced 17 components in blackcurrant juice, and 43 components in the press cake. The condensate and press cake from raspberries contained 16 components, and blackberry condensate and press cake contained 22 and 36 components, resp. STI

2

udies on the characteristics of scented rice.

Volatile sulfur compounds evolved from cooked rice.

[Mizuki, E.; Matsuki, C.; Morinaga, K.; Shida, S. *Japanese Journal of Crop Science* 47 (3) 375-380 (1978) [15 ref. Ja, en] [Fac. of Agric., Miyazaki Univ., Miyazaki, Miyazaki 880, Japan]
The S-containing volatiles evolved from cooking scented var. of rice (Otsune-bozu, K10 and Shiroi-kichi, 11) and an ordinary var. (Koganenishiki) were analysed by 2 different gas chromatographic techniques (hydrogen flame ionization detector (FID) and flame photometric detector (FPD)). By FID, 3 S-containing volatiles were identified as methyl mercaptan, dimethyl sulphide and dimethyl disulphide. With FPD, 5 peaks on the chromatogram were recognised and identified as H_2S , methyl mercaptan, dimethyl sulphide, n-butyl mercaptan and dimethyl disulphide. No qualitative differences in S-containing volatile compounds in the head space were found between scented (Shiroi-kichi) and ordinary (Koganenishiki) rice var., nor were differences found between hulled rice and milled rice of these 2 var. [Fromm En summ.] SP

23

Flavour of cooked rice.]

[Misaka, H. *Journal of the Japanese Society of Food and Nutrition [Eiyo to Shokuryo]* 30 (6) 421-424 (1977) [4 ref. Ja, en] [Lab. of Food Chem., Ochanomizu Univ., Bunkyo-ku, Tokyo, Japan]

H_2S which seemed to contribute to the aroma of cooked rice was determined quantitatively by colorimetry and it was found that 2-4 $\mu g\%$ of H_2S was contained in the distillate obtained during the cooking of rice. The effect of volatiles on the sensory quality of cooked rice was studied by comparing the GLC patterns of head space vapour of cooked rice of good taste from fresh crops with those of inferior tasting stored rice and/or with those of twice cooked rice. Total amount of volatiles from good-tasting cooked rice was 4-5 \times that from inferior tasting rice. Lower boiling volatiles from fresh crops represented 80-90% of total aroma compounds but those from stored rice were 45%. On the other hand, carbonyls (C3-C6) from stored rice represented 30% of total aroma compounds, which corresponded to 10 \times those from fresh crops. Aroma concentrate of cooked rice was prepared and separated into basic, neutral and acidic fractions. Basic fraction showed the characteristic aroma of cooked rice, which was somewhat pyrazine-like and had a resemblance to the aroma produced from a heated aqueous solution of proline with dihydroxyacetone. AS

124

Estimation of volatile compounds in fermented milk products - a review. [Review]

[Haast, J. de; Lategan, P. M.; Novello, J. C. *South African Journal of Dairy Technology* 10 (3) 125-128 (1978) [56 ref. En] [Dep. Dairy Sci., UOFS, Bloemfontein, 9300, South Africa]

Various methods used for extraction and quantitative detn. of volatile compounds in milk products are

discussed, and applications and advantages or disadvantages of the various methods are outlined. MEG

125

[Changes in volatile constituents of Bulgarian yoghurt.]

[Kondratenko, M. S.; Guiocheva, B. C. *Lait* 58 (577) 390-396 (1978) [3 ref. Fr, en] [Cent. Lab. of the Dairy Ind., 134, Boulevard 9 Septemvri, Sofia 1618, Bulgaria]

Volatile constituents in samples of pasteurized milk taken before inoculation, at 20-210 min after inoculation with yoghurt starter, and after 1, 2, 10, 15 and 30 days of storage at 4° C were analysed by gas chromatography. Volatile constituents found in pasteurized milk consisted of 3 unidentified peaks, that were not considered further since they did not change during yoghurt manufacture or storage, acetone, 2-butanone, ethanol, and traces of acetaldehyde. Yoghurt sampled at the point of coagulation contained the same constituents plus ethyl acetate and diacetyl. Levels of acetaldehyde began to rise 1 h after inoculation, were max. at the time of coagulation, fell slightly over 15 days of storage and then decreased to very low levels after 30 days. Ethyl acetate and diacetyl levels followed a similar pattern. Levels of 2-butanone, ethanol and acetone were fairly constant initially but acetone levels fell sharply after 2 days of storage and ethanol levels rose after 10 days. Sensory evaluation indicated that the yoghurt had the same sour milk taste after 15 and 30 days of storage but that the aroma was weaker at 30 than at 15 days. JDR

126

Production of volatile flavor compounds in ultra high-temperature processed milk during aseptic storage.

[Jeon, I. J.; Thomas, E. L.; Reineccius, G. A. *Journal of Agricultural and Food Chemistry* 26 (5) 1183-1188 (1978) [36 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St. Paul, Minnesota 55108, USA]

Volatile flavour compounds in UHT processed milk were investigated to determine their role in off-flavour development during aseptic storage. The milk samples were processed at 145° C for 3 s, with and without added ascorbic acid, and stored at 3°, 22°, or 35° C for 5 months. Flavour isolates were prepared by steam vacuum distillation and subsequent extraction of the distillate with dichloromethane. The isolates were analysed using gas chromatography and MS. The milk was regularly analysed by various chemical methods and evaluated by a taste panel during storage. 26 compounds were identified, 7 of which have not previously been reported in UHT milk. Gas chromatographic profiles indicated that 2-pentanone, 2-heptanone, 2-nonanone, and n-hexanal increased most in concn. during storage. The rate of increase in odd carbon-numbered methyl ketones (C3-13) was dependent upon storage temp., whereas the rate of increase in aldehydes was dependent upon both O_2 content and temp. of storage. Although methyl ketones were the most abundant class of compounds, aldehydes appeared to be most important in contributing to the off-flavour of stored UHT milk. AS

127

Headspace analysis as a means of evaluating flavour producing volatiles in milk products.

Haast, J. de; Lategan, P. M.; Novello, J. C.

South African Journal of Dairy Technology 10 (3) 155-158 (1978) [8 ref. En, af] [Dep. of Dairy Sci., UOFS, Bloemfontein, 9300, South Africa]

Headspace vapours, containing volatile compounds usually present in cultured milk products, were sampled at 60°, 80° and 95°C with and without application of vacuum. Largest peak areas were obtained by gas chromatographic analysis when the samples were taken at 95°C after application of vacuum. The following solutions containing volatile compounds usually present in yoghurt and cultured milks were analysed by the headspace method: (i) an aqueous standard, (ii) a standard made up in raw milk, (iii) a whey standard, prepared by coagulating milk with 1% lactic acid and centrifuging at $24\,000 \times g$, for 20 min, and (iv) a standard made up in milk coagulated with 1% lactic acid. Comparison of the gas chromatograms of the headspace vapours showed that recoveries of acetaldehyde, ethanol, acetone and isopropanol from (ii) were similar to those from (i). Since recoveries of ethanol, acetone and isopropanol from (iv) were lower than from (i), (ii) or (iii), it is considered that analysis of (iii) is most suitable for measuring volatile compounds in yoghurt. The method can detect 1 mg acetaldehyde/l. MEG

128

Recent advances in the study on aroma compounds of milk and dairy products. [Lecture]

Badings, H. T.; Nester, R.

XX International Dairy Congress, Conferences

Conferences 77ST, 30pp. (1978) [many ref. En]

[Netherlands Inst. for Dairy Res., PO Box 20, 6710 BA, Ede, Netherlands]

Chemical compounds contributing towards weed taints and feed off-flavours, oxidation flavour defects, light-induced flavour, rancidity, unclean flavours, fruity and malty flavours, and heat-induced flavours are reviewed. Compounds responsible for the typical flavour of concentrated milk and dried milk products, cultured dairy products, cream, butter and various cheeses are discussed. [See FSTA (1979) 11 6P883.] DMK

129

The analysis of essential oils and extracts (oleoresins) from seasonings - A critical review. [Review]

Salzer, U.-J.

CRC Critical Reviews in Food Science and Nutrition 9(4) 345-373 (1977) [168 ref. En] [Harmann & Reimer GmbH, 3450 Holzminden, Postfach 138, Federal Republic of Germany]

A critical review of analytical methods employed for the detn. of the relevant components of seasonings is presented. Where the available methods were inadequate, new ones have been devised. Particular emphasis has been placed on those methods of analysis that provide a rapid and sufficiently accurate appraisal of seasoning extracts and essential oils from seasonings under routine control laboratory conditions. At the same time, the margin of error of these methods has

been determined. The individual seasoning extracts were assessed according to the following criteria: essential oil - cardamom, laurel leaves, cloves, origanum (marjoram), sage, and thyme; essential oil and nonvolatile lipids - dill seed, coriander, caraway, mace, nutmeg, pimento (allspice), and celery seed; essential oil and/or pungent ingredients - capsicum, ginger, and pepper; essential oil and/or colouring matter - turmeric (curcuma) and paprika; and essential oil and other components - garlic, onion, and cinnamon. AS

130

[Studies on flavour components of shoyu. III. Simple discrimination between genuine fermented and chemical shoyu (soy sauce) on the basis of the volatiles.]

Nunomura, N.; Sasaki, M.; Asao, Y.; Yokutsuka, T.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 51 (12) 709-711 (1977) [16 ref. Ja, en] [Cent. Res. Lab., Kikkoman Shoyu Co. Ltd., 399-Noda, Noda-shi, Chiba-ken 278, Japan]

Japanese shoyu is divided into 2 main classes, genuine fermented shoyu, and chemical shoyu prepared from chemical hydrolysate of soybeans. About 90 samples of flavour concentrates of the 2 kinds of shoyu were quantitatively analysed by gas chromatography (GC, liquid phase: LAC-2R-446), and it was found that 2 volatile components were by far larger in quantity in chemical shoyu than in genuine fermented shoyu. The 2 components were identified as ethyl 4-oxovalerate and 4-pentanolide by combined GC-MS. In genuine fermented shoyu ethyl 4-oxovalerate was not detected by either GC or GC-MS, and 4-pentanolide was hardly, or not at all, present. Consequently chemical discrimination between genuine fermented and chemical shoyu might become easier and speedier by adopting this GC quantitative analysis of the 2 volatile components in comparison with the present popular analysis for detecting 4-oxovaleric acid which is proved to be contained abundantly in chemical shoyu. However, those 2 components are organoleptically considered not to contribute significantly to the characteristic flavour of chemical shoyu. Possible formation pathways of ethyl 4-oxovalerate and 4-pentanolide are also discussed. AS

131

[Compounds responsible for 'roasted' flavour and aroma.] Röstaromen. [Review]

Baltes, W.

Deutsche Lebensmittel-Rundschau 75 (1) 2-7 (1979) [64 ref. De] [Inst. für Lebensmittelchem., Tech. Univ., Berlin]

Compounds responsible for 'roasted' flavour and aroma in various foods are discussed, with reference to their structures, precursors, mechanisms of formation, and specific organoleptic properties. Groups of compounds covered include pyrazines, oxazoles, thiazoles, thiophenes, pyrroles, pyridine derivatives, furans, maltol, tetrahydrofurans, and carbonyl compounds. The preparation of artificial 'roasted' flavourings is also briefly considered. AJDW

atile acids in wines. I. Formation and composition of acetic acid during fermentation.] Flüchtigen Säuren des Weines. I. Bildung und Verlauf der Essigsäure im Verlauf der Gärung. [Ge, C.; Spadinger, C. *Deutsche Lebensmittel-Rundschau* 75 (1) 12-15 (1979) [9 ref. De] [Max von Pettenkofer-Inst., desgesundheitsamt, D-1000 Berlin 33] Comparative studies on detn. of acetic acid in wine by Boehringer enzymic method and detn. of total volatile acids by the conventional distillation method were conducted, using 18 wines of various types. The results show total volatile acid concn. generally to be higher than acetic acid concn. The enzymic method gave considerably lower s.d. than the distillation method. Studies in changes in acetic acid and total volatile acid concn. during fermentation were conducted using 25 musts of various types and qualities. Different patterns of changes in acetic acid concn. were observed; these were not related to must quality. In general, concn. of acetic acid and of total volatile acids in wines were not closely related; however, in samples with high volatile acid concn. (> 600 mg/l.), acetic acid comprised almost all of the volatile acid. Studies on 21 wines showed no clear relationship between concn. of acetic acid and of ethyl acetate, except that all samples with acetic acid concn. < 1 g/l. contained < 80 ethyl acetate/l. AJDW

33 Comparison of the flavors of Chinese 'Keemun' black tea and Ceylon black tea. [Sakakura, H.; Kosuge, M.; Yamanishi, T. *Agricultural and Biological Chemistry* 42 (11) 2157-2159 (1978) [9 ref. En] [Lab. of Food Chem., Chubu Univ., Tokyo, Japan] Aroma concentrates were prepared by steam distillation of 3 teas, Chinese Keemun black tea, and the Ceylon black teas Uva (flavour quality season tea) and Ambula (non-flavour-quality season). Concentrates were studied by GLC; gas chromatograms are illustrated for the 3 teas and 2 GLC columns. Compounds identified, and their respective GLC peak numbers are tabulated. Keemun tea contained greater amounts of geraniol, geranic acid, benzylalcohol and phenylethanol, and lower amounts of linalool and linalool oxides than did the Ceylon teas. This may explain the characteristic heavy rosy aroma of Keemun tea. DIH

34 Coffee aromatic isolate. [Cazenave, P. (Societe d'Assistance Technique pour Produits Nestle SA) *United States Patent* 4 118 521 (1978) [En] A process is described for isolating an aromatic coffee fraction in which an aqueous coffee extract is contacted with an azeotropic mixture of pentane with either methylene chloride or trichloro-trifluoroethane. FT

135

Method for fixing cryogenically condensed coffee aromatics in a glyceride carrier. [Howland, R. F.; Jasovsky, G. A.; Galanti, J. A. (General Foods Corp.) *United States Patent* 4 119 736 (1978) [En]

A method is described for fixing cryogenically condensed coffee aromatics in a liquid glyceride in which a CO₂ frost containing coffee aroma gas is melted in a pressure vessel and the composition, after removal of water, is combined in the vessel with a liquid glyceride. IFT

136

Observations on the use of porous polymers for collecting volatiles from synthetic mixtures reminiscent of fermented ciders.

[Williams, A. A.; May, H. V.; Tucknott, O. G. *Journal of the Science of Food and Agriculture* 29 (12) 1041-1054 (1978) [28 ref. En] [Long Ashton Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

Conditions for collecting volatile components on Porapak Q and desorbing them for gas chromatographic examination were investigated using a synthetic mixture representing the aroma components of cider. Optimum recoveries and least errors were obtained using a piston displacement procedure, 32 mg Porapak (in 0.32 cm outside diam. x 11 cm tube), a temp. of 150°C for 20 min for desorption and ratios of vapour:liquid not exceeding 5:1. Tenax GC gave more consistent results than Porapak Q for non-polar compounds with b.p. greater than that of hexyl acetate. AS

137

[Effects of processing (freezing and canning) on aroma compounds of peaches.]

[Souty, M.; Reich, M. *Annales de Technologie Agricole* 27 (4) 837-848 (1978) [30 ref. Fr, en] [Sta. Tech. des Produits Vegetaux, Cent. de Recherches d'Avignon, 84140 Montfavet, France]

GLC-MS studies were conducted on the less volatile fraction of the aroma compounds of (i) fresh peaches, (ii) canned peaches made from fresh raw material, (iii) frozen peaches (stored for 5 months at -20°C), (iv) canned peaches prepared from frozen peaches, and (v) 'oxidized' frozen peaches, i.e. samples thawed slowly in air. All peach samples were of the var. Pavie Babygold 6. Diagrams and tables of results are given. The results show that the main change during processing is oxidation of terpene alcohols, especially linalool. This oxidation is especially marked for frozen fruit; the aroma of (iv) is appreciably less intense than that of (ii), although it may be considerably improved by minimization of oxidation. Canning results in formation of hotrienol and α -terpineol. Lactone contents did not differ significantly between (i), (ii), (iii), (iv) and (v). AJDW

138

Volatiles in distillates of processed radish of Japanese origin.

[Kjaer, A.; Madsen, J. O.; Maeda, Y.; Ozawa, Y.; Uda, Y.]

Agricultural and Biological Chemistry 42 (11) 1989-1996 (1978) [10 ref. En] [Dep. of Organic Chem., Tech. Univ. of Denmark, 2800 Lyngby, Denmark]

The volatiles from Japanese radish, processed by fermentation with rice bran after drying ('Hoshi Takuan') or salting ('Shiooshi Takuan') of fresh radish were separated and to a large extent identified by MS. A similar study was conducted on salted radish ('Yamakawa Zuke'). Isothiocyanates, constituting the major flavour characteristics of fresh radish, are rapidly catabolized during processing. Acetic acid, alcohols, carbonyl compounds, and acetals, together with various S-containing products, dominate the volatile fractions of fermented radish. A somewhat different picture prevails in the case of salted radish. The mass spectra of several S compounds are discussed. AS

139

Identification of additional volatile constituents of carrot roots.

Buttery, R. G.; Black, D. R.; Haddon, W. F.; Ling, L. C.; Teranishi, R.

Journal of Agricultural and Food Chemistry 27 (1) 1-3 (1979) [8 ref. En] [Western Regional Res. Lab., Sci. & Education Administration, USDA, Berkeley, California 94710, USA]

9 compounds not previously identified in carrot volatiles were characterized from the oxygenated fraction of the steam-volatile oil. The compounds were identified by using capillary GLC-MS and by packed column GLC + IR spectra. Compounds identified, and approx. % in whole oil are p-cymen-8-ol 0.9; p-vinylguaiaicol 0.4, eugenol 0.7, geranylacetone 0.03, β -ionone 0.03, geranyl isobutyrate 0.05, elimicin 0.2 and geranyl 2-methylbutyrate, 0.3; 4-methylisopropenylbenzene (a hydrocarbon) was also identified, but was thought to arise from p-cymen-8-ol in the injector. An additional GLC peak, with a raw carrot-like aroma, was also present, but could not be positively identified. DIH

140

Volatile constituents of southernpea seed [*Vigna unguiculata* (L.) Walp.].

Fisher, G. S.; Legendre, M. G.; Lovgren, N. V.; Schuller, W. H.; Wells, J. A.

Journal of Agricultural and Food Chemistry 27 (1) 7-11 (1979) [13 ref. En] [Southern Regional Res. Cent., Sci. & Education Administration, USDA, New Orleans, Louisiana 70179, USA]

32 samples of southernpea seed [*Vigna unguiculata* (L.) Walp., subsp. *unguiculata*] from commercial and experimental cv. were analysed for volatile constituents. Low concn. of potential toxicants were found in all samples. 16 other constituents were also identified and determined semiquantitatively. No relation was found between concn. of any volatile and any known genetic or cultural variable. A novel gas chromatographic-data system-controlled MS technique for the analysis of foods and feeds for volatile potential toxicants is described. AS

141

[Changes in the flavour of shortbread-type products as a result of addition of soy flour. I. Studies on doughs.] Aromaveränderungen bei Feinbackwaren (Mürbeteiggebäck) durch Sojamehlzusatz. I. Mittelt. Untersuchungen in Teigen.

Heimann, W.; Timm, U.; Rapp, A.; Knipser, W.

Deutsche Lebensmittel-Rundschau 75 (1) 27-31 (1979) [16 ref. De, en, fr] [Inst. für Lebensmittelchem., Univ. Karlsruhe, 7500 Karlsruhe, Federal Republic of Germany]

Studies were conducted on flavour compounds in samples of shortbread-type products made (i) with or (ii) without addition of 5% enzyme-active full-fat soy flour. Flavour compounds were separated and identified by GLC/MS. Tables and diagrams of results are given. The results show that, although the same peaks are present in chromatograms of (i) and (ii), peak heights of 11 fractions were greater in (i) than in (ii). 9 of these 11 peaks were identified as 1-pentanol, n-hexanal, 1-hexanol, oct-2-tr-enal, oct-1-en-3-ol, non-2-tr-enal, benzaldehyde, deca-2-tr,4-c-dienal and deca-2-tr,4-tr-dienal. Peak height of n-hexanal in (i) was approx. 25 x greater than that in (ii). Non-2-tr-enal, and 2 unidentified components, present only at trace concn. in (ii), were present at appreciable concn. in (i). Further studies with samples enriched with added purified lipoxigenase showed that the increased level of all the above compounds (except benzaldehyde, 1-hexanol and the 2 unidentified components) in (i) is attributable to lipoxigenase activity. AJDW

142

[Components of essential oil from Piemontese tarragon.]

Frattini, C.; Belliardo, F.; Reyneri, C.; Bicchi, C. *Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol* 60 (5) 286-290 (1978) [15 ref. It, de, en, es, fr] [Univ. di Torino, Turin, Italy]

The authors confirmed the work of other investigators, and identified menthone, o-methylisoeugenol, elemicin, p-methoxy benzaldehyde, p-methoxy cinnamic alcohol, isobornyl acetate and 2 γ -lactones (C11 and C12). AS

143

Variations in the composition of oil in citronella.

Iruthayathas, E. E.; Herath, H. M. W.; Wijesekera, R. O. B.; Jayewardene, A. L.

Journal of the National Science Council of Sri Lanka 5 (2) 133-146 (1977) [14 ref. En]

GLC analysis of the leaf and flower essential oils from 11 strains of citronella grass showed quantitative differences in the 31 chemical constituents between the strains. The magnitude of the differences varied widely, with greatest variability in monoterpene alcohols, phenolics and some terpene alcohols (camphene and limonene). RM

analytical indices of essential oil from winter
ns.]
lo, F.; Giacomo, A. di
nze Derivati Agrumari 47 (3) 326-346 (1977)
It] [Sta. Sperimentale per l'Ind. delle Essenze dei
vati Agrumari, Reggio Calabria, Italy]
bring analytical data for lemon essential oil up to
with regard to new extraction techniques, analyses
made on Sicilian samples obtained by the new
natura' (low-pressure extraction from lemon peel
out pulp), pelatura (peeling) and torchiatura
ssing, recovery from peel treated by 'sfumatura')
niques. Physico-chemical and spectrophotometric
acteristics (sp. gr., optical rotation, refractive index,
ldehydes, non-volatile residue, solubility in 90°
hol and spectrophotometric data) are tabulated and
C results shown graphically and in a table. RM

5
st-harvest technology of cinnamon and utilization
cinnamon waste (leaves and twigs).
uthi, J. S.; Varkey, A. C.; Bhat, A. V.
Indian Arecanut, Spices & Cocoa Journal 1 (4) 87-93
(1978) [5 ref. En] [Cent. Food Tech. Res. Inst., CSIR
Complex, Trivandrum-19, Kerala, India]
A study conducted on the optimum stage and season
harvest has shown that fully developed shoots of
um 1.5-3.0 cm harvested from 2-2.5 m high plants in
e rainy season (July-Aug.) gave commercially
satisfactory bark. Fresh bark and leaves gave 2.5 and
2% oil (dry wt. basis) as compared to 1.38 and 1.46%
tained from dried bark and dried leaves resp. Oil
stilled in country stills was dark and opaque due to the
ntent of Cu and Fe. This oil could be clarified by the
dition of 0.5% citric acid (levels tried 0.25, 0.50, 0.75
d 1.00%) followed by treating with powdered 2%
aCl. The impurities which settled can be separated by
ecantation and further clarification could be achieved
centrifugation of the oil at 3000 rev/min for 10 min.
e characteristics of the oil thus obtained is given. It
ntained 85-90% eugenol. The use of 5% KOH
stead of 3% recommended by AOAC gave much
gher and consistent value for eugenol in the oil. The
l kept well in brown bottles and PVC containers for
6 months at 27-32°C without deterioration in its
uality. CFTRI

46
[Analysis of Spanish essential oils. I. Species of
Thymus.]
Mateo, C.; Morera, M. P.; Sanz, J.; Calderon, J.;
Hernandez, A.
*Rivista Italiana Essenze, Profumi, Piante Officinali,
Aromi, Saponi, Cosmetici, Aerosol* 60 (11) 621-627
(1978) [8 ref. It, fr, en, de, es] [CSIC, Madrid, Spain]
Essential oils of 16 spp. of Thymus from various
locations in Spain were examined by GLC, preparative
GLC, MS, IR and NMR spectrometry and combinations
of these methods. Results are tabulated and summarized
in a table giving the % composition for the 16 spp. RM

147

To know with the nose: keys to odor identification.
Cain, W. S.
Science, USA 203 (4379) 467-470 (1979) [11 ref. En]
[John B. Pierce Foundation Lab. & Yale Univ., New
Haven, Connecticut 06519, USA]

Successful odour identification (e.g. in foods) depends
on: commonly encountered substances; a long-standing
connection between an odour and its name; and aid in
recalling the name. The absence of any 1 ingredient
impairs performance dramatically, but the presence of
all 3 permits ready identification of scores of substances,
with performance seemingly limited only by the
inherent confusability of the stimuli. AS

148

Premiums and coupons as a potential source of
objectionable flavor in cereal products.
Heydaneck, M. G.; Woolford, G.; Baugh, L. C.
Journal of Food Science 44 (3) 850-853 (1979) [En]
[Flavor Tech. Dep., John Stuart Lab., The Quaker Oats
Co., Barrington, Illinois 60010, USA]

Current practice in the cereal industry, is the use of
multi-coloured graphics on plastics-foil constructions
and various coupons and premiums as packaging
inserts. The volatiles in these inserts, if not controlled,
can impart undesirable flavour to packaged foods.
Volatiles isolated from various printed coupons and
premiums exhibit a wider range of component concn.
and odour. Chemical and organoleptic methods for
measuring simulated volatile transmission from
coupons and premiums through overwrap films have
shown classical materials to be unsuitable in many
cases. Instrumental measurements showed a
polyester/PVDC/polyester film to be an almost
absolute barrier to premium and coupon volatiles at the
concn. normally encountered. IFT

149

Concord wine composition as affected by maturity
and processing technique.
Nelson, R. R.; Acree, T. E.
American Journal of Enology and Viticulture 29 (2)
83-86 (1978) [19 ref. En] [Dep. of Food Sci., New York
State Agric. Exp. Sta., Cornell Univ., Geneva, New
York 14456, USA]

Concord grapes were harvested from the vineyards
of New York State Agricultural Experiment Station,
Geneva, during the 1976 vintage. Wines were prepared
by 3 techniques commonly used for producing Concord
wines of various styles. A white wine was prepared
from 12° Brix fruit that was pressed immediately after
crushing, a red wine was prepared from 16° Brix fruit
that was crushed and fermented on the skins, and
another red wine was prepared from 16° Brix fruit
processed by thermal vinification. All musts were
ameliorated in order to produce finished wines
containing 12% v/v ethanol. The flavour components of
each wine were extracted with Freon 113 (1,1,2-
trichloro-1,2,2-trifluoroethane). Compounds in the
solvent extract were separated by gas chromatography
and their odours evaluated using a sniffing device
attached to the gas chromatographic effluent port.

19 compounds were identified by combined gas chromatography-MS. The wines showed vastly different varietal characters that cannot be explained by variation in methyl anthranilate concn. alone. Sensory analyses were conducted in order to examine the correlation of odour intensity with methyl anthranilate concn. and total volatile concn. This report demonstrates that the volatile composition of Concord wine differs significantly with maturity and processing technique. AS

150

[Effects of clarification and fermentation temperature on the content of volatile substances in white wines.] [Lecture]

Bertrand, A.

Annales de Technologie Agricole 27 (1) 231-233 (1978) [Fr] [Inst. d'Oenologie, Univ. de Bordeaux II, Bordeaux, France]

Comparative studies on effects of static clarification (at 0° or 22°C) and fermentation temp. (15°, 25° or 35°C) on the concn. of volatiles in white wine are described. Tables of results are given, including data for the concn. of hexanol-1, phenyl-2-ethanol, total higher alcohols, ethyl acetate, isoamyl acetate, phenyl-2-ethyl acetate, and total other esters. The results show that clarification reduces concn. of higher alcohols and increases concn. of esters (especially isoamyl acetate and phenyl-2-ethyl acetate), and therefore improves overall quality. Concn. of higher alcohols and most esters decreased with increasing fermentation temp.; concn. of acetic acid increases with increasing temp., and ethyl acetate concn. was max. at 25°C. Data are also presented showing effects of sulphitation and bentonite treatment of the must on concn. of volatiles in the wine. [See FSTA (1979) 11 8H1218.] AJDW

151

[Characterization of grapes and wines on the basis of certain typical constituents.] [Lecture]

Drawert, F.; Schreier, P.

Annales de Technologie Agricole 27 (1) 367-375 (1978) [24 ref. Fr, en] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ., Munich, Federal Republic of Germany]

Studies on the potential for differentiation between grape and wine var. on the basis of volatile compound concn. are discussed; volatile compounds were determined by GLC after preliminary separation on kieselguhr. Tables and diagrams are given showing concn. of various volatiles in Ruländer, Riesling, Traminer, Scheurebe, Müller-Thurgau and Morio-Muscat grapes and wines. Statistical analysis by the F-test showed excellent discrimination between var. on the basis of concn. of aroma compounds (especially terpenes) originating in the grapes, but relatively poor discrimination between var. on the basis of concn. of esters formed during fermentation. [See FSTA (1979) 11 8H1218.] AJDW

152

[Mixed phase columns for GLC analysis of products of acetic and alcoholic fermentations.] [Lecture]

Cabezudo, D.

Annales de Technologie Agricole 27 (1) 421-422 (1978) [Fr] [Industrial Fermentation Inst., Madrid, Spain]

GLC analysis of flavour and aroma compounds in alcoholic and acetic fermentation products on 2 columns (5% squalane/90% Carbowax 300/5% 1,2-ethyl-hexyl sebacate or 50% Ucon LB 550X/50% Carbowax 300, each on Chromosorb G) is discussed. 20 highly volatile constituents were detected in GLC analysis of vinegar and various wines and spirits. [See FSTA (1979) 11 8H1218.] AJDW

153

[Application of GLC to characterization of wine grape varieties.] [Lecture]

Rapp, A.; Hastrich, H.

Annales de Technologie Agricole 27 (1) 423-426 (1978) [Fr] [Forschungsanstalt Geilweilerhof, Siebeldingen, Federal Republic of Germany]

The potential of GLC analyses of volatile constituents for characterization of wine grapes of different var. is discussed with reference to tables and diagrams of data for the var. Riesling, Morio-Muscat and Sylvaner. It is concluded that it is possible to differentiate grape var. on the basis of GLC analyses. Effects of maturity and region of cultivation of grapes on volatile compound concn. are also briefly considered. [See FSTA (1979) 11 8H1218.] AJDW

154

Volatiles of wild strawberries, *Fragaria vesca* L., compared to those of cultivated berries, *Fragaria × ananassa* cv. Senga Sengana.

Pyysalo, T.; Honkanen, E.; Hirvi, T.

Journal of Agricultural and Food Chemistry 27 (1) 19-22 (1979) [25 ref. En] [Tech. Res. Cent. of Finland, Food Res. Lab., SF-02150 Espoo 15, Finland]

Volatile components of Finnish wild strawberry, *Fragaria vesca* L., and of cultivated strawberry, *Fragaria × ananassa* cv. Senga Sengana were studied by combined GLC-MS. In all, 87 compounds were identified in the wild and 58 in the cultivated berries. 2,5-Dimethyl-4-methoxy-3(2H)-furanone was identified as the main volatile component in the berries of *F. vesca* L. and as an abundant component also in the cultivated berries. Other compounds reported in the paper for the 1st time as strawberry volatiles include 3-methyl-2-butenyl acetate, methyl nicotinate, carveyl acetate, methyl anthranilate, methyl N-formylanthranilate, verbenone, citronellol, myrtenol, 6-methyl-5-hepten-2-ol, eugenol, vanillin, 2-methoxy-4-vinylphenol, and 4-vinylphenol. AS

155

[Present knowledge on the composition of the aroma of little-known tropical fruits.] [Review]

Dupaigne, P.

Fruits 33 (6) 413-423 (1978) [112 ref. Fr, de, en, es, ru] [IRFA, BP 5035, 34032 Montpellier Cedex, France]

This review discusses and presents a bibliography of recent work on the aroma composition of bananas, pineapples and passion fruits, jackfruit (*Artocarpus integrifolia*), jambolan (*Eugenia jambos*), feijoa (*Feijoa sellowiana*), avocado, coconut, guava, pawpaw and mango. Little is known about the aroma components of other fruits, e.g. litchi and cashew fruits. RM

megastigma-5,8-dien-4-one, an aroma constituent of yellow-passion fruit and Virginia tobacco.]
 megastigma-5,8-dien-4-on, ein Aromastoff der gelben Passionsfrucht und des Virginia-Tabaks.

Boile, E.; Enggist, P.; Winter, M.; Furrer, A.; Schulte-K. H.; Egger, B.; Ohloff, G.

Helvetica Chimica Acta 62 (1) 67-75 (1979) [29 ref. De, Firmenich SA, Forschungslab., CH-1211 Geneve 8, Switzerland]

The E and Z stereoisomers of megastigma-5,8-dien-4-one were isolated by preparative GLC from the neutral fractions II of the aroma concentrate of yellow passion fruit obtained as previously described [see [A (1977) 9 2]270]. Both these novel flavour compounds were synthesized by a 2-step non-mimetic route starting from 2,6,6-trimethylcyclohex-1-one, the E-isomer also by acid-catalysed hydration, rearrangements of ionol and damascol epoxides and hydroxy ionols and damaseol. Such mimetic conversion indirectly supports a possible link from oxidative degradation of carotenoid precursors possibly related to canthaxanthine. RM

7

lemons and limes. Large-fruited limes, production for the future for DOM-TOM.]

Boile, R.; Cassin, J.; Tisseau, R.

Revista Italiana Essenze, Profumi, Piante Officinali, Farmaci, Saponi, Cosmetici, Aerosol 60 (9) 511-524 (1978) [28 ref. Fr] [IRFA-Gerdat, Montpellier, France]

The botanical origin, the fruit and juice characteristics and the utilization of lemons and of limes (Citrus aurantifolia) and large-fruited limes (Citrus latifolia) are discussed and details of their physico-chemical characteristics and the composition of their essential oils are tabulated. Results obtained from the 1977 Corsican harvest are then reported. The juice and essential oils of lemons (var. Eureka) and of Mexican, Tahiti and Bears limes were analysed and results shown graphically and in tables. The changes in some juice and oil components during growth of the fruits are also shown. Max juice yields were obtained at 65 g for Tahiti limes (39.6%), 67 g for Bears limes (49.3%), 40 g for Mexican limes (42.6%) and 100 g for lemons (37.9%). The pH, free acidity, citric and malic acid contents were about the same for all the var. and did not change appreciably with increasing fruit size. Limes contained much less ascorbic acid than lemons (15-20 mg/100 g) and the concn. fell with increasing fruit size. The essential oil of Bears and Tahiti limes contained about twice as much γ -terpinene as the other 2 var., that of lemons more limonene. Early harvesting was desirable to ensure optimum fruit and essential oil quality. RM

58

Chemistry of deep fat fried flavor. [Lecture]

Chang, S. S.; Peterson, R. J.; Ho, C.-T.

ACS Symposium Series 75, 18-41 (1978) [13 ref. En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ. of New Jersey, New Brunswick, New Jersey 08903, USA]

Aspects covered are the volatile flavour constituents (VFC) in deep-fat fried foods, VFC originating from the food used for frying, VFC produced by the interaction

between food and oil, systematic identification of the volatile decomposition products (VDP) of frying, and non-volatile decomposition products and minor constituents. Laboratory apparatus for deep-fat frying under simulated conditions and apparatus used for treating pure triglycerides under simulated deep-fat frying conditions are described and illustrated in diagrams. Tables of data show the VDP produced by corn oil, hydrogenated cottonseed oil, trilinolein and triolein under simulated deep-fat frying conditions; a total of 220 compounds were identified. Among them the unsaturated lactones were of particular interest. [See FSTA (1979) 11 8N352.] AL

159

Instrumental analysis of volatiles in food products. [Lecture]

Dupuy, H. P.; Brown, M. L.; Legendre, M. G.; Wadsworth, J. I.; Rayner, E. T.

ACS Symposium Series 75, 60-67 (1978) [15 ref. En] [S. Regional Res. Cent., USDA, New Orleans, Louisiana 70179, USA]

A simple, rapid and direct gas chromatographic technique was used to elute and resolve the volatile components from soybean oil samples. The profile of volatiles obtained indicated the quality of oil flavour. Specific peaks of the chromatogram were identified by MS. Correlation coeff. between taste panel flavour scores for the oils and the instrumental data obtained were significant at 99% and 95% confidence levels. The method should be applicable to other raw and processed foods. [See FSTA (1979) 11 8N352.] AL

160

Preliminary identification of volatile flavor compounds in the neutral fraction of roast beef.

Min, D. B. S.; Ina, K.; Peterson, R. J.; Chang, S. S.

Journal of Food Science 44 (3) 639-642 (1979) [En] [Dep. of Food Sci., Cook Coll., Rutgers, State Univ., New Brunswick, New Jersey 08903, USA]

Volatile flavour compounds (VFC) in the neutral fraction of roast beef flavour isolate were identified in this study. VFC from 150 lb of eye round roast beef were isolated and separated into acidic, basic and neutral fractions. Since the latter fraction was the only one to have a pleasant roast beef-like aroma, it was the only fraction further analysed. The components of the neutral VFC fraction were separated into relatively pure subfractions by repetitive gas chromatography and collection in hairpin cold traps. The relatively pure subfractions were then analysed by GLC-MS combination. > 120 compounds were identified including a number of lactones, substituted aromatic compounds, furan compounds, and S-containing compounds. The aforementioned classes of compounds may play significant roles in the roast beef flavour. IFT

161

Retention and stability of volatile sulfur-containing compounds in chicken meat.

Farbood, M. I.; MacNeil, J. H.

Journal of Food Science 44 (3) 652-655 (1979) [En] [Dep. of Food Sci., Pennsylvania State Univ., University Park, Pennsylvania, 16802, USA]

[^{35}S]methionine was used to generate radioactive volatile S-containing compounds. The degree of retention and stability of these compounds in a cold chicken meat slurry was determined. It was found that substantial amounts of radioactive volatile S-containing compounds were trapped in the slurry (0.71 μCi). It was also concluded that 44.0% of the total methanethiol generated was trapped in the slurry. Further investigation revealed that the major portion of these highly volatile S-containing compounds, which were trapped in the slurry, was no longer volatile and would not be released upon heating. Subsequent heating of the slurry for 4 h under reflux and in an open vessel resulted in a 32.3% and 33.8% loss of radioactivity, resp. However, the major loss of radioactivity occurred within the first h of cooking with little loss of activity after that period. The results of a chloroform-methanol fractionation showed that 90.7% of the trapped radioactive S-containing compounds were associated with the protein fraction of meat. The association of these compounds with the protein fraction was confirmed using picric acid precipitation. The remaining radioactive S-containing compounds retained in the aqueous and lipid fraction, 8.95% and 0.35% resp., could also play an important role in flavour. IFT

162

High-resolution gas chromatographic profiles of volatile organic compounds produced by microorganisms at refrigerated temperatures. Lee, M. L.; Smith, D. L.; Freeman, L. R. *Applied and Environmental Microbiology* 37 (1) 85-90 (1979) [17 ref. En] [Dep. of Chem., Brigham Young Univ., Provo, Utah 84602, USA]

3 different strains of bacteria isolated from spoiled, uncooked chicken were grown in pure culture on Trypticase soy agar supplemented with yeast extract. The volatile organic compounds produced by each culture were concentrated on a porous polymer precolumn and analysed by high-resolution gas chromatographic MS. 20 different compounds were identified. Both qualitative and quantitative differences in the chromatographic profiles from each culture were found. AS

163

Gas chromatography as an industrial process operation - application to essential oils. Bonmati, R.; Guiochon, G. *Perfumer & Flavorist* 3 (5) 17-22 (1978) [En] [ELF Petroleum Corp. USA, New York, USA]

This process describes the construction and operation of industrial scale preparative GLC and shows results obtained when applied to various separation problems: separation of trans-trans and trans-cis farnesols; extraction of humulene and β -caryophyllene from clove essential oil; extraction of limonene from Florida orange essential oil; deterpenation of lemon oil; and separation of trans anethole from fennel oil. The process permits significant reductions in processing costs and the production of new compounds. RM

164

Methods for the analysis of oilseeds. III. Determination of moisture and volatile matter content. United Kingdom, British Standards Institution *British Standard BS4289:Part 3*, 3pp. ISBN 0-529-10420-6 (1978) [En] [2 Park Street, London W1A 2BS UK]

This revised standard is identical with ISO 665:1977 [see FSTA (1978) 10 5U371] AL

165

Comparison by twelve laboratories of the odour qualities of nine chemicals sniffed from the bottle and as gas-liquid chromatography effluents. Dravnieks, A.; McDaniel, H. C.; Powers, J. J. *Journal of Agricultural and Food Chemistry* 27 (2) 336-346 (1979) [12 ref. En] [Odor Sci. Cent, IIT Res Inst., Chicago, Illinois 60616, USA]

12 laboratories carried out a collaborative study to compare the odours of 9 pure chemicals as sniffed from the bottle and as GLC effluents at 3 different concn. Odour intensities varied according to known psychophysical functions. There was some confusion between odours of sequentially eluted odorants, but it was not great and could be reduced by improvements in design of GLC splitter ports, suggestion for which are made. Many of the problems of contamination of one odorant with another are the same involving MS identification. Recognizability of an odour was not greatly impaired when the odorant was delivered from a GLC effluent port as compared with sniffing the pure compound. Although 126 judges generated 136 descriptor terms for the 9 chemicals, the terms could be classified into 22 groups and there was good agreement among the 12 laboratories involved. AS

166

Dependence of odor intensity on the hydrophobic properties of molecules. A quantitative structure odor intensity relationship. Greenberg, M. J.

Journal of Agricultural and Food Chemistry 27 (2) 347-352 (1979) [33 ref. En] [Quaker Oats Co., Barrington, Illinois 60010, USA]

The relationship between odour intensity and physicochemical properties of odorants was investigated using the Hansch approach, a quantitative structure-activity relationship (QSAR) technique which utilizes linear free energy relationship parameters and multiple regression analysis. Also studied was whether these QSAR techniques can be used to predict odour intensity regardless of odour descriptor within and between homologous series of organic compounds. AL

167

Beer flavour terminology. Meilgaard, M. C.; Dalglish, C. E.; Clapperton, J. F. *Journal of the Institute of Brewing* 85 (1) 38-42 (1979) [9 ref. En] [Stroh Brewery Co., Detroit, Michigan, USA]

working groups of the European Brewery Convention, the American Society of Brewing Chemists, and the Master Brewer's Association of the Americas have developed a system of flavour terminology to meet the dual needs of enabling brewers to communicate effectively about flavour and naming each separately identifiable flavour note in it. The system comprises 44 terms to meet the 1st objective while 78 additional terms are suggested for the 2nd. Industry is urged to use this terminology and to build on it. AS

[**Flavour terminology.**] Sammlung beschreibender Begriffe für die objektive sensorische Beurteilung des Bier. II. Gaard, M. C.; Dalgliesh, C. E.; Clapperton, J. F. *Wissenschaft* 32 (2) 33-40 (1979) [9 ref. De, en, fr] The Brewery Co., Detroit, Michigan, USA] See preceding abstr.

Effects of cellular fatty acids on the formation of flavour esters by sake yeast. Kikawa, T.; Yoshizawa, K. *Microbiological and Biological Chemistry* 43 (1) 45-53 (1979) [21 ref. En]

The mechanism whereby addition of saturated fatty acids and their derivatives to sake yeast cultures promotes formation of desirable flavour esters, but addition of unsaturated fatty acids suppresses them, was investigated. Exogenously added palmitic or oleic acid was incorporated as such into cellular fatty acids of the K-7 (K-7) strain of sake yeast. Exogenously added heptadecanoic or linoleic acid (neither of which occur normally in K-7) was incorporated as such into cellular phosphatidylcholine and triglyceride. Effects of addition of fatty acids to growth medium on production of isoamyl acetate, the chief flavour ester, by K-7 were studied. The concn. of isoamyl acetate in the medium increased with m.p. of the acid added, and the relationship was linear on a semi-log plot between 20°C and 40°C. Medium concn. of isoamyl acetate was inversely related to amount of linoleic acid incorporated into cellular fatty acids. Effects of fatty acid addition on medium concn. of ethyl acetate, ethanol, isoamyl alcohol and isoamyl acetate are tabulated. Incubation of K-7 cells initially grown on oleic acid in a medium containing clotrimazole (an antifungal agent acting on the cell membrane) stimulated increase of medium isoamyl acetate concn. It was concluded that the changes in formation of isoamyl acetate, and other flavour esters, observed with growth of K-7 on different fatty acids, results from membrane permeability changes, as the flavour esters are excreted into the medium. DIH

70

1,3-dioxanes and 1,3-dioxolanes as constituents of the acetal fraction of Spanish fino sherry. Muller, C. J.; Kepner, R. E.; Webb, A. D. *American Journal of Enology and Viticulture* 29 (3) 207-212 (1978) [9 ref. En] [Louisiana Tech. Univ., Ruston, Louisiana 71272, USA]

4 isomeric cyclic acetals of glycerol and acetaldehyde: cis-5-hydroxy-2-methyl-1,3-dioxane [3674-23-5], trans-5-hydroxy-2-methyl-1,3-dioxane [3674-24-6], cis-4-hydroxymethyl-2-methyl-1,3-dioxolane [3674-21-3] and trans-4-hydroxymethyl-2-methyl-1,3-dioxolane [3674-22-4] were detected in Spanish fino sherry by gas chromatography and identified by MS and Kovat's indices. AS

171

[**Determination of the percentage of grain whisky in commercial blends by isotope mass spectrometry.**]

Koziet, J.; Bricout, J. *Annales de la Nutrition et de l'Alimentation* 32 (5) 941-946 (1978) [7 ref. Fr, en] [120 Avenue Foch, 94015 Creteil Cedex, France]

A method is proposed for detn. of the % of malt and grain whisky in blends via the $^{13}\text{C}/^{12}\text{C}$ isotope ratio. This is due to the different photosynthetic C-fixation mechanisms of the raw material: grain whisky is derived from maize, operating the Hatch-Slack C-fixation which reduces the ^{13}C ratio of the vegetable matter by 2-4% (vs. atm ^{13}C), malt whisky from barley operates the Calvin cycle and reduces ^{13}C by 20%. The application is illustrated by tabulated results of ^{13}C detn. in 14 pure malt, 12 grain and 11 blended whiskies. RM

172

[**GLC determination of volatile compounds in carbon-disulphide-extracted spirits.**]

Smedt, P. de; Cresto, B.; Liddle, P. A. P. *Annales de la Nutrition et de l'Alimentation* 32 (5) 923-929 (1978) [many ref. Fr, en] [Martini & Rossi, 19 Avenue Michelet, 93400 Saint-Ouen, France]

A technique was developed for routine quantitative analysis of spirits allowing detn. of the max. number of volatile components: volatile compounds are extracted simply and reproducibly by CS_2 from a small sample (10 ml). Conditions of extraction and GLC analysis (packed or capillary column, manual or automatic injection, automatic processing of results) are discussed. Analysis of non-conc. CS_2 extracts on capillary column required a splitless injection using the solvent effect. The technique allows detn. of esters (hence distinction of various spirits, investigation of the effect of lees, control of refrigeration treatment, detn. of malt: grain ratios in blended whiskies), and detn. of some compounds serving as index for ageing and type of oak used in the casks, etc. RM

173

Aroma study of essences in non-alcoholic soft drinks. Isolation and concentration of aromas.

Beernaert, H.; Gossele, J. *Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene* 69 (4) 516-535 (1978) [8 ref. En, de, fr] [Inst. for Hygiene & Epidemiology, Brussels, Belgium]

4 isolation techniques were compared for extraction of flavour substances from freshly-purchased commercial natural essences. Compounds isolated by the techniques used (simple extraction, continuous liquid-liquid extraction, single and double stage vacuum

distillation, and steam distillation) were identified by GLC/MS/electronic data processing. Tabulated data show compounds identified by each technique with peak area %, for 1 sample each of lemon, orange, pineapple and cola essences. Steam distillation was the most efficient technique, and comparison of chromatograms for the 4 isolation techniques shows that steam distillation does not lead to artefact formation. As well as flavour compounds, substances such as butylated hydroxytoluene, aliphatic hydrocarbons and plasticizers are also extracted by steam distillation. Compounds identified, and peak area % are tabulated for steam distillates of 1 mandarin essence, 8 lemon essences and 9 orange essences. Aspects of their composition are discussed; essences from the same fruit but from different manufacturers have similar qualitative, but different quantitative composition. Carvone was detected in some orange essences, despite the presence of antioxidants, showing that the essence was aged. Variations in composition make detection of adulteration in soft drinks containing essences difficult. DIH

174

[Comparison of volatile fractions of Moscow and Zhigulevsk beers.]

Nedugova, N. E.

Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 6, 40-42 (1978) [6 ref. Ru] [Moskovskii Ordena Trudovogo Krasnogo Znameni Tekh. Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

The basic volatile components of Moscow and Zhigulevsk beers originating in the same brewery were analysed. Ethanol, n-propanol, isobutanol, amyl alcohol, isoamylalcohol, diacetyl, acetoin, total aldehydes, acetic acid, propionic, butyric, isobutyric, isovaleric acids, and methyl- and ethyl acetate contents were determined. Aromatic substances are produced at various rates in making different types of beer, and depend on the intensity of yeasts metabolism and on the nutrient content of the medium. The Moscow beer was higher in all the substances investigated except for the volatile acids. STI

175

[Effect of chilling on the quality and composition of vintage brandies.]

Semenenko, N. T.; Kotova, R. I.; Frolova, Z. N.

Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii 33 (9) 32-34 (1978) [Ru] [Tekhnologo-konstruktorskii Inst. NPO "Yaloveny", USSR]

The effect of cooling to -10° , -7° or -5°C for 3, 5, 7 and 10 days, and the effect of filtering at -10° and -3°C was studied using 8 types of Moldavian brandies. Prior to, and after the treatment, contents of alcohol, sugar, tannins, lignins, ethanol lignin, colour intensity and sensory properties were determined. Chilling was found to lower the levels of ethanol lignin and total tannins and to slightly reduce colour intensity. Gas chromatography showed the amount of volatile compounds; these were not affected quantitatively but the level of some substances changed. Hexyl acetate, heptyl acetate, ethyl caproate, ethyl pelargonate, ethyl

caprylate and ethyl laurate contents decreased. Quality is not affected by this reduction. There was an even lower reduction of low-boiling alcohols (octanol, nonyl, decyl alcohol). STI

176

Descriptive sensory analysis of whisky flavour. Piggott, J. R.; Jardine, S. P.

Journal of the Institute of Brewing 85 (2) 82-84 (1979) [30 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Strathclyde, Glasgow G1 1SD, UK]

A descriptive vocabulary of 35 terms was compiled for whisky. Odour, flavour and after-flavour were separately assessed on 5-point scales. After 2 sets of flavour profiles of 10 whiskies had been collected, the assessors were given a period of training, during which they familiarized themselves with chemical standards used to define the descriptive terms. Finally, another 2 sets of profiles were collected. Training was found to improve reproducibility and discrimination. Odour or flavour descriptors alone were sufficient to distinguish between whiskies, and odour and flavour terms together provided little more information than odour alone. AS

177

[Application of high performance liquid chromatography to beverage analysis.]

Bricout, J.

Annales de la Nutrition et de l'Alimentation 32 (5) 947-955 (1978) [2 ref. Fr, en] [Inst. de Recherches Appliquees aux Boissons, 120 Avenue Foch, 94015 Creteil Cedex, France]

The application of high performance liquid chromatography to beverage analysis is reviewed. Liquid-liquid chromatography with columns packed with stationary organic phases chemically bound to silica micro-particles was highly efficient and selective, easy and versatile. Applications discussed with the aid of chromatograms include detn. of flavouring compounds of low volatility, e.g. aromatic aldehydes in brandy (from oak casks) with an alkyl nitrile stationary polar phase, amarogentin in *Gentiana lutea* or glycyrrhizin in *Glycyrrhiza glabra* (20-400 p.p.m.) by reverse phase chromatography with an apolar stationary phase, and mixtures of water soluble synthetic dyes by paired ion chromatography with an apolar stationary phase. RM

178

[The influence of the amount of supplied fertilizer and vinyl-house cultivation on the aroma of tea.]

Takei, Y.; Ishikawa, Y.; Hirao, N.; Fuchinoue, H.; Yamanishi, T.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 52 (11) 505-511 (1978) [4 ref. Ja, en] [Lab. of Food Chem., Ochanomizu Univ., Bunkyo-ku, Tokyo, Japan]

To assess the effects of cultural conditions on tea aroma, concentrates were analysed from green tea and fresh tea leaves from plants grown with excessive, standard or zero fertilizer level, and from plants grown under vinyl covering (with standard fertilizer).

ation). Excessively fertilized green tea had a and lasting heavy aroma lacking briskness, and ded in higher-boiling aroma components one, 5,6-epoxy- β -ionone, dihydroactinidiolide and). Cis-3-hexenyl acetate, cis-3-hexenol and cis-3-yl hexanoate, which are responsible for briskness, present in reduced proportions. In the aroma ntrate from green tea cultivated under vinyl, ol, cis-3-hexenyl hexanoate, cis-jasmone and e were reduced, and β -ionone, 5,6-epoxy- β -ionone dihydroactinidiolide were considerably increased ared to the standard cultivated tea. The analyses ed to support the sensory evaluations. [From En .] JRR

acterisation and differentiation of grape dies by multiple discriminant analysis.

Bier, P.; Reiner, L.

Journal of the Science of Food and Agriculture 30 (3) 327 (1979) [11 ref. En] [Inst. für Lebensmitteltech. & tytische Chem. der Tech. Univ. München, Freising- enstephan, Federal Republic of Germany] as chromatography has shown that clear, titative differences exist between various flavour tituents of German and French grape brandies as as French cognacs. The amounts of some selected our compounds from 24 grape brandies were nitted to multiple discriminant analysis. riminant analysis was carried out in 3 parts esponding to the column chromatographic pre- ration of volatile compounds into 3 fractions (I: t-polar compounds; II: oxo compounds; III: rophilic substances). Using the components of tion I a statistically highly significant differentiation ween French cognacs and the remaining groups of pe brandies was obtained. With the components of ctions II and III some misclassifications occurred. y after employing all the constituents of fractions I- was a statistically highly significant separation ween French and German grape brandies as well as group of cognacs achieved. Among the esters edominantly the ethyl esters of octanoic, butanoic, 2- anoic and 2-hydroxy-isocaproic acid contributed wards the separation and classification of individual oups. The best differentiation was given by the ntents of 1-octanol and damascenone. AS

30

ompositions of the volatiles of peel oil and juice om Citrus unshiu.

ajima, I.; Yanai, T.; Nakamura, M.; Sakakibara, H.; ayashi, K.

Agricultural and Biological Chemistry 43 (2) 259-264 (1979) [3 ref. En] [Kawasaki Res. Lab., T. Hasegawa Co., td. Kawasaki, Japan]

Volatile components of peel oil and juice from Citrus unshiu were studied. The peel oil and aroma oncentrate from the juice were separated into ydrocarbons and oxygenated compounds by column chromatography. These fractions were analysed by GLC and combined GLC/MS. 98% of the peel oil onsisited of hydrocarbons such as d-limonene, -terpinene, myrcene and α -pinene. The aroma

concentrate from the juice was composed of the same hydrocarbons (60%) and oxygenated compounds (40%) such as 3-methylbutanol, cis-3-hexenol, trans-2-hexanal and n-hexanal. 90% of the oxygenated compounds were alcohols and aldehydes. AS

181

Pyrazine compounds in canned sweet corn flavour.

Lee, C. Y.

Food Chemistry 3 (4) 319-322 (1978) [15 ref. En] [New York State Agric. Exp. Sta., Cornell Univ., Geneva, New York 14456, USA]

Dimethyl pyrazine (DMP) and dimethyl ethyl pyrazine (DMEP) were identified by GLC in canned sweet corn as important aroma compounds formed during thermal processing, presumably by reaction of free amino acids and sugars during canning. No DMP or DMEP were detected in extracts from fresh sweet corn. RM

182

Review of quantitative analyses of citrus essential oils.

Shaw, P. E.

Journal of Agricultural and Food Chemistry 27 (2) 246-257 (1979) [55 ref. En] [US Citrus & Subtropical Products Lab., USDA, Winter Haven, Florida 33880, USA]

A compilation of reported quantitative values for individual components of cold-pressed oils of sweet orange, grapefruit, mandarin, lemon, lime, bitter orange, bergamot, certain hybrid oils, and of distilled lime oil is presented. Different analytical methods used to determine these values are compared. Reasons for differences in quantitative values determined by GLC are ascribed to method of preliminary separation, method of calculating relative % composition, type of column or detector used, decomposition during GLC separation, and sample history. Valid conclusions regarding chemotaxonomy of hybrids cannot be made from the available data because of variable sample histories and analytical techniques. AS

183

Studies on the volatile compounds in mushrooms.

Pyysalo, H.

Dissertation Abstracts International, C 38 (2) 299; 14pp. (1977/1978) [En] Helsingin Kauppakorkeakoulu, Helsinki, Finland]

This publication summarizes studies on volatile natural compounds, especially those in fresh mushrooms. In order to determine the amount of the toxic acetaldehyde N-methyl-N-formyl hydrazone remaining in the processed *Gyromitra exculenta*, these mushrooms were dried and cooked by common household methods. The amount of material reducing potassium iodate was then measured and calculated as gyromitrin. AS

184

[Aroma sorption properties of amorphous sucrose and lactose.] Aromasorptionseigenschaften von amorpher Saccharose und Lactose.

Niedick, E. A.; Babernics, L.

Gordian 79 (2) 35-36, 38-40, 42-44 (1979) [36 ref. De, en][Univ., Karlsruhe, Federal Republic of Germany]

Results of preliminary trials on the sorption properties of amorphous sucrose and lactose are reported. Amorphous sugars were produced by freeze-drying in a laboratory freeze-drier or in a microbalance. Results, shown graphically and in tables, revealed that sorption by amorphous sugars was several orders of magnitude larger than that by the crystalline forms; sorption was not a surface but a vol. phenomenon. The first model experiments indicated the sorbable amounts of aroma compounds in up to 600 h, the sorption kinetics, effect of water vapour on aroma sorption and the stability of the aroma bond. Aroma compounds studied were acetone, ethanol, propanol, butanol, diethyl ketone, isopropenyl acetate, phenyl acetate, guaiacol, vanillin, camphor, and menthol. RM

185

cis-hept-4-en-2-ol in corn volatiles; identification and synthesis.

Buttery, R. G.

Journal of Agricultural and Food Chemistry 27 (1) 208 (1979) [5 ref. En][W. Regional Res. Lab., Sci. & Education Administration, USDA, Berkeley, California 94710, USA]

cis-hept-4-en-2-ol was synthesized in 60% overall yield by the oxidation of cis-hex-3-enol to cis-hex-3-enal which was then reacted with methylmagnesium iodide. The IR absorption spectrum of the synthetic sample was identical with that of a sample isolated from corn husk volatiles, confirming that the corn husk hept-4-en-2-ol is in the cis form. AS

186

[A simple technique for flavour evaluation of edible oils by gas liquid chromatography. I. Correlations of flavour score with GLC profile of volatile compounds in irradiated soybean oils.]

Okabe, T.; Komoda, M.; Matsubaka, S.

Journal of Japan Oil Chemists' Society [Yukagaku] 27 (12) 866-869 (1978) [8 ref. Ja, en][Sugiyama Chem. & Ind. Lab., Kanagawa-ken, Japan]

Soybean oil was oxidized using 7000 lux fluorescent light for different periods. Volatile compounds were isolated by bubbling purified N_2 through oil heated at 150°C , collected on activated charcoal, extracted with CS_2 and analysed by temp.-programmed GLC. The used oils were evaluated by expert panels. Good correlations were found between total GLC peak areas and adjusted grassy flavour scores. The threshold level of the grassy flavour in soybean oil corresponds to about 400 (expressed as total peak intensity ratio of the volatile compounds). The technique provides good reproducibility and is used for evaluating commercial soybean oil during storage. AS

187

Effect of heat treatments on the volatile composition of coconut oil.

Pai, J. S.; Lomanno, S. S.; Nawar, W. W.

Journal of the American Oil Chemists' Society 56 (4) 494-497 (1979) [16 ref. En][Dep. of Food Sci. & Nutr.

Univ. of Massachusetts, Amherst, Massachusetts 01003, USA]

Fresh coconut oil was heated under different conditions for 48 h at 180°C . The heat treatments included heating in vacuo, heating in air and heating in air and water. The samples were distilled under high vacuum and the volatiles thus obtained were analysed by combined gas chromatography-MS. In all heated samples, a series of n-alkanes and i-alkenes, n-alkyl methyl alkanones, alkenals, γ - and δ -lactones, methyl and ethyl esters and free fatty acids were identified. The relative amounts of these compounds varied with the type of heat treatment to which the coconut oil was subjected. AS

188

Influence of volatile and nonvolatile fractions on intensity of Cheddar cheese flavor.

McGugan, W. A.; Emmons, D. B.; Larmond, E.

Journal of Dairy Science 62 (3) 398-403 (1979) [19 ref. En][Food Res. Inst., Agric. Canada, Ottawa, Ontario, K1A 0C6, Canada]

Sensory evaluation of cheese reconstituted from fractions of mild and aged cheese showed that the watersoluble fraction made the greatest contribution to the intensity of the cheese flavour. The cheese fractions used to prepare the reconstituted samples were: watersoluble fractions from mild cheese and from aged cheese; residues from mild and aged cheese remaining after extraction of the cheese with methanol, methylene chloride and water; undeodorized fat centrifuged from mild and aged cheese; and deodorized cheese fat. The undeodorized cheese fat was the source of flavour volatiles incorporated into the reconstituted samples. The volatiles in the undeodorized fat produced no significant difference in the flavour intensities of the samples reconstituted with fat from mild or aged cheese. The nature of the residue had a small but significant influence on the perceived flavour intensities of the reconstituted cheese. It was suggested that the more highly degraded protein of aged cheese releases flavour compounds in the mouth more readily than does the protein of the residue from mild cheese. AS

189

Swiss cheese flavor. I. Chemical analysis.

Biede, S. L.; Hammond, E. G.

Journal of Dairy Science 62 (2) 227-237 (1979) [32 ref. En][Dep. of Food Tech., Iowa State Univ., Ames, Iowa 50011, USA]

Attempts were made to relate chemical composition to flavour in 7 Swiss cheeses representing a wide variety of flavour types. The cheeses were fractionated into (i) oil-soluble, (ii) water-soluble volatile and (iii) water-soluble non-volatile flavour-bearing components and a flavourless matrix. The characteristic sweet flavour of Swiss cheeses was concentrated in (iii) and was possibly produced by amino acids, particularly proline, in the presence of Ca^{2+} and Mg^{2+} ; no lactose, glucose or galactose was found. Neutralization of (i) and (ii) with Na_2CO_3 attenuated aromas of these fractions, indicating that acids were important; the level of each free fatty acid in the aqueous phase decreased with increasing chain length. Neutral compounds in (i) also

ed a significant role in flavour, and GLC revealed separate aromas. These neutral volatiles were identified tentatively as pyrazines, carbonyls, lactones, phenols. Flavour of (ii) was due mainly to acetic, propionic and butyric acids, partially neutralized with NaOH; varying amounts of diacetyl were also present. See following abstr. for part II.] CDP

O

Swiss cheese flavor. II. Organoleptic analysis. de, S. L.; Hammond, E. G. *Journal of Dairy Science* 62 (2) 238-248 (1979) [21 ref.]. [Dep. of Food Tech., Iowa State Univ., Ames, Iowa 50011, USA] Swiss cheeses and the oil-soluble, water-soluble volatile, and water-soluble non-volatile fractions isolated from them were evaluated by the flavour profile method. The intensities of 9 perceived flavour attributes were correlated with analytical values of some flavour components. In the water-soluble volatiles, acidity, sweetness and lipolysed flavour were correlated with total free acids, diacetyl and butyric acid, respectively. Synthetic mixtures of acetic, propionic and butyric acids, diacetyl and ammonia reproduced the flavours of the isolated fractions. In the water-soluble non-volatiles, acidity could not be correlated with lactic acid or pH, but it was correlated with the amounts of small peptides and amino acids. The sweetness of the water-soluble non-volatiles depended on the interaction of Ca and Mg ions with small peptides and amino acids. Small peptides and amino acids also were responsible for the earthy-nutty flavour of this fraction. The burned and roasty flavour of the water-soluble non-volatiles was attributed to medium sized (tri to hexa) peptides. The fatty and volatile flavours of the oil-solubles were caused primarily by free fatty acids. Neutral oil-soluble compounds seemed to suppress the perception of acidity, and in excess to cause an undesirable 'fermented' flavour. The flavour of whole cheese could not be predicted from those of its fractions. In whole cheese, sweet, nutty and volatile flavours correlated with dipeptides, burned flavours with lactic acid, and fatty flavours with acetic acid. The acid flavours correlated with the % of water-insoluble fatty acids in the aqueous portion of the cheese. [See preceding abstr. for part I.] AS

91

Essential oil of *Laurus nobilis*. Quergo, H. H.; Retamar, J. A. *Revista Italiana Essenze, Profumi, Pianta Officinali, Aromi, Saponi, Cosmetici, Aerosol* 60 (11) 635-636 (1978) [4 ref. It, fr, en, de, es] [Univ. Nacional de Tucuman, San Miguel de Tucuman, Argentina] The essential oil of *Laurus nobilis* was obtained by steam distillation from fresh leaves and young twigs with a yield of 0.23% (0.16% directly and 0.07% by extraction of distillation waters). The compounds in the oils from direct extraction and from distillation waters were identified and quantified by GLC. RM

192

Problems (undated) of the assessment of the quality of odorants and flavourings. Mack, H. *H&R [Haarmann & Reimer] Contact* No. 22, 23-27 (undated) [En]

193

Correlation between measurable properties (chemical/physical) and flavour. (In '7th European Symposium' [see FSTA (1979) 11 10A713]) [Lecture] Sydow, E. von; Akesson, C. pp. 176-186 (1977) [15 ref. En] [SIK, Swedish Food Inst., S-400 23 Göteborg, Sweden] The possibility of predicting the sensory properties of aroma and flavour using only gas chromatographic (GC) methods was investigated. The accuracy of these predictions for practical application, and the possibility of using GC data to predict preference judgements of aroma and flavour were also investigated. Functional regression models and classification models were used to interpret the data obtained, and results obtained with these models are discussed. Applications of these models are described. SP

194

Adjunct fermentation: volatile substances formed during the fermentation of individual sugars. Pollock, J. R. A.; Weir, M. J. *Journal of the American Society of Brewing Chemists* 34 (2) 70-75 (1976) [8 ref. En] [Pollock Int. Ltd., Ladbroke Close, Woodley, Reading RG5 4DX, UK] Conc'n. of volatile esters and acids decrease in successive cycles when the same yeast is used repeatedly to ferment pure carbohydrate substrates. The effect is independent of the sugar being fermented. Maltose produced slightly smaller amounts of several volatiles than did fructose, glucose, or sucrose. Corn syrup produced more than the individual sugars, an effect not merely due to the presence of glucose and maltose together. Yeast type markedly affects the production of volatile substances in these systems. The formation of individual volatile substances in malt and adjunct worts is influenced by agitation and yeast concn., different volatiles behaving differently according to the conditions used. AS

195

[Aroma and flavour of beer. Role of carbonyl and heterocyclic compounds.] [Review] Cabeduzo, M. D. *Birra e Malto* 23 (8) 21-24, 26-27, 30-31, 33, 35-36 (1978) [39 ref. It, de] [Istituto di Fermentazione Industriale, Madrid, Spain]

196

[A simple sampling device for GLC analysis of headspace samples from cans or foil packs.] Beschreibung einer einfach herzustellenden Probenahme-Vorrichtung für gas-chromatographische

Kopfraumanalysen aus Blech- oder Folienpackungen. Trauzettel, H.

Deutsche Lebensmittel-Rundschau 74 (11) 410-411 (1978) [De] [Bundesanstalt für Materialprüfung, 1000 Berlin 45]

A device for collection of headspace samples from packs of food is described. A needle-valve unit (for laboratory gases) is modified by removal of the coupling nut, enlargement of the channel to permit free movement of the needle, substitution of a longer, hardened needle for the original type, and manufacture of a cylindrical connecting piece to which the modified valve may be screwed, a hermetic seal being achieved by means of a flexible gasket. For headspace sampling, the lower end of the connecting piece is glued to the pack to be sampled, the syringe is screwed on and evacuated, the pack is perforated by the needle, and headspace gas is collected for GLC analysis. After removal of the connecting piece, the perforation in the pack may be re-sealed. AJDW

197

Application of high-performance liquid chromatography to the solution of flavor problems in beer caused by low-volatile compounds.

Davis, D. P.; Palamand, S. R.

Journal of the American Society of Brewing Chemists 34 (2) 55-59 (1976) [9 ref. En] [Anheuser-Busch Inc., St. Louis, Missouri 63118, USA]

High-performance liquid chromatographic (HPLC) methods were used to measure several low-volatile flavour compounds of beer as well as those introduced into beer from processing aids and packages. Superiority of the HPLC methods over the conventional methods used for the measurement of these compounds was shown in respect to speed, convenience, and specificity of such analyses. AS

198

Gas chromatographic determination of beer volatiles by carbon disulfide extraction: improved methodology, data handling, and interpretation.

Stenroos, L. E.; Siebert, K. J.; Meilgaard, M. C.

Journal of the American Society of Brewing Chemists 34 (1) 4-13 (1976) [10 ref. En] [Stroh Brewery Co., Detroit, Michigan 48226, USA]

The reproducibility of CS₂ extraction was improved by decreasing the proportion of salt added and by standardizing the conditions. A new liquid phase and the use of glass columns and Teflon-faced septa led to better gas chromatographic separation and reproducibility. An autoinjector and a computing integrator provided further improvements and greater convenience of operation. A computer program was developed which prints out the results for each peak and produces a statistical summary of repeat detn. It also calculates the probable flavour significance of the analysis employing known flavour thresholds and interactions. Use of the method is illustrated with a study of the course of commercial fermentations in open and closed vessels. A number of domestic and imported beers and malt liquors were also analysed.

199

Correlation of triangular taste test panel results and statistical differences between headspace volume profiles.

Hoff, J. T.; Herwig, W. C.

Journal of the American Society of Brewing Chemists 34 (1) 1-3 (1976) [15 ref. En] [Miller Brewing Co., Milwaukee, Wisconsin 53201, USA]

A procedure is described for routine gas chromatographic analysis of beer headspace volatiles which requires minimal operator time. Reproducibility of the procedure is illustrated for 12 components. A method for predicting triangular taste panel performance, using the t-statistics calculated from the '% Total Peak Area' (PTPA) and pooled s.d. from 25 replicate analyses, is introduced. Correlation between the PTPA method and triangular taste panel results is demonstrated. AS

200

Odor filters as a laboratory aid for quality assurance.

Bernstein, L.

Brewers' Digest 53 (10) 46-47 (1978) [1 ref. En] [Schwarz Services Int., Ltd., Mount Vernon, New York, USA]

A series of simple tests which enable some of the specific chemical contributors to beer aroma to be qualitatively identified is presented. 2 fl oz of the beer to be tested is placed in each of 5 glasses, and additions are made to each as follows: (i) 2-3 drops water (control); (ii) 2-3 drops 2% CuSO₄; (iii) 2-3 drops 2% ZnSO₄ + 1 ml 10% NaHCO₃; (iv) 2 drops 2% CuSO₄ + 1 ml 25% HgCl₂ in ethanol; and (v) 2 drops 2% CuSO₄ + 1 ml ethanol. Glasses are compared to determine the significance of certain sulphur compounds in the aroma as follows: (i) vs. (ii), no difference implies no contribution from H₂S or mercaptans; (i) vs. (iii) same and (ii) vs. (iii) different implies a mercaptan contribution; if both (i) and (ii) are different to (iii), H₂S is implicated. Comparison of (iv) and (v) indicates a significant contribution from dialkyl sulphides if the aromas differ. JRR

201

Effects of crop level on chemical composition and headspace volatiles of Lodi Zinfandel grapes and wines.

Cordner, C. W.; Ough, C. S.; Kasimatis, A. N.; Kissler, J. J.

American Journal of Enology and Viticulture 29 (4) 247-253 (1978) [24 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

A method is given for quantitative analysis of wine headspace. Reproducibility of the method, for 24 identified peaks, is $\pm 10-15\%$ if internal standards are chosen correctly. Unidentified peaks of lesser intensity generally have larger coeff. of variation. Variations in headspace analysis between field replications were too large for the data to be pooled. All calculations were done on individual field replications. Stepwise discriminant analysis was used to show that

wines could be correctly sorted on the basis of analysis of either must, wine, or headspace. Selective st, wine, and headspace data were correlated linearly h crop levels. AS

02

Analysis of sake components presented to the sake trest in 1978.]

Shinokawa, Y.; Shiinoki, S.; Otsuka, K.
Report of the Research Institute of Brewing [Jozo Nihon Jozokai Zasshi] 150, 7-9 (1978) [5 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

Distribution of sake components, especially flavour components such as isoamyl alcohol and isoamyl acetate, are listed and some characteristics of components in highly ranked sake, as evaluated by sensory analysis, are discussed. YN

03

Flavour change during ageing of sake. XVI. Determination of disulphides in sake by the Ellman agent.]

Oba, T.; Takahashi, K.; Kobayashi, M.; Adenuma, M.; Namba, Y.
Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 73 (9) 719-722 (1978) [10 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

Detn. of disulphides in sake by a colour reaction with Ellman reagent, 5,5'-dithiobis(2-nitrobenzoic acid), was examined. Colour intensity increased in the aged sake and correlated well with some components related to sake ageing. [See FSTA (1979) 11 6H900 for part XV.] YN

204

Flavour change during ageing of sake. XVII. Correlation between organoleptic ageing degree and changes of chemical components.]

Sato, S.; Oba, T.; Takahashi, K.; Sugitani, M.
Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 73 (11) 873-877 (1978) [9 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

13 sake samples were stored at 40°C for 30 and 60 days and correlations between degree of organoleptic ageing and changes in chemical components were examined. Over-matured smell was correlated with a decrease in tryptophan, increase in optical density at 420 nm, alkaline buffer action, and 3-deoxyglucosone and decreasing rate of acidity. Ageing of taste was correlated with a decrease in tryptophan, increases in optical density at 420 nm and alkaline and acidic buffer actions after 60 days storage, and decrease in 2,2'-diphenyl-1-picrylhydrazine reacting substance after 60 days storage. Colour increase was correlated with an increase in 3-deoxyglucosone, ferricyanide reducing substance, optical density at 280 nm, alkaline and acidic buffer actions and decrease in tryptophan. [See preceding abstr. for part XVI.] YN

205

Flavour change during ageing of sake. XVIII. Application of factor analysis and multiple regression analysis to sake ageing.]

Sato, S.; Oba, T.; Takahashi, K.; Sugitani, M.
Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 73 (11) 878-882 (1978) [16 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

Data obtained from 13 sake samples on degree of organoleptic ageing and sake components related to ageing were statistically analysed. Analysis by the R-technique extracted factors relating to amino acids, carbonyl compounds, sugars, reducing substances, and acids. Analysis by the Q-technique extracted factors concerning sensitivity to ageing. Sake easy to age contained more ferichrysin, Fe, Cu, Zn, amino acids, and tryptophan and had greater optical density at 280 nm and alkaline and acidic buffer actions than sake difficult to age which contained more acetaldehyde and pyruvic acid. A regression formula for strength of over-matured smell and for ageing of taste was obtained by multiple regression analysis. [See preceding abstr. for part XVII.] YN

206

Role of fermentation and influence of breadmaking method on composition of volatile constituents in bread crumb.]

Richard-Molard, D.; Nago, M.-C.; Drapron, R.
Bulletin des Anciens Eleves de l'Ecole Francaise de Meunerie No. 288, 285-292 (1978) [6 ref. Fr] [Lab. de Biophysique des Aliments, INRA, Nantes, France]

Volatile constituents in the crumb were analysed by capillary column chromatography (direct analysis at 20°C and after heating to 70°C for 30 min) and by smell. Volatile components and individual volatile organic acids were compared for bread made by the 'direct' 'poolish' and 'starter' methods. Variations in the acid fraction were studied in relation to breadmaking parameters. Ten main volatile constituents were found (ethanol representing 95% of the total quantity), and nearly 100 volatile constituents in all. Some 20 of them appeared to determine the aroma of the crumb. The general mode of breadmaking made little qualitative or quantitative difference to the volatile constituents except for the acids. The poolish and starter methods resulted in 2 and 20 times resp. as much acetic acid as did the direct method, but conventional fermentation gave about 4 times the amount of isobutyric acid produced on starter. Intense kneading exerted most effect in the case of isobutyric and isovaleric acids, increasing these in the direct method to about 3.5 times the level with slow kneading; the quantities of these acids were less affected by intense kneading when using prefermentation. Increasing yeast addition from 2 to 2.2% also resulted in increases in the iso-acids in the direct method, and in these and acetic acid in the poolish method. MJD

207

Gas chromatography and spectral method application for the study of the Bulgarian yoghurt flavour.

Gyosheva, B. H.; Rusev, P.
Nahrung 23 (4) 385-392 (1979) [11 ref. En, de, ru]

The volatile flavour compounds formed during the fermentation of yoghurt were isolated by head space analysis, concentrated by distillation, separated by gas chromatography and identified by NMR and IR spectroscopy. Acetaldehyde, 2-butanone, ethanol, diacetyl and ethyl acetate were found. IN

208

Volatile compounds in UHT-sterilized milk during fluorescent light exposure and storage in the dark.

Mehta, R. S.; Bussette, R.

Journal of Food Protection 42 (3) 256-258 (1979)

[8 ref. En] [Dep. of Anim. Sci. & Ind., Kansas State Univ., Manhattan, Kansas 66506, USA]

When UHT sterilized milk (140°C for 3.5 s) was exposed to fluorescent light over a 30-day period at 22°C, acetaldehyde, propanal, pentanal, and hexanal increased in concn. On storage of the milk in the dark, after a 2-wk period of light exposure, these same compounds decreased in concn. No characteristic patterns were noticed in the other chromatographic peaks. When a 5 × diluted distillate of light-exposed milk was added to normal milk, a taste-panel criticized the milk as strongly oxidized, tallowy or oily. AS

209

Microchemistry and meat.

Patterson, R. L. S.; Voyle, C. A.

Proceedings of the Analytical Division of the Chemical Society 16 (4) 128-129 (1979) [En] [Meat Res. Inst., Langford, Bristol, BS18 7DY, UK]

Microchemical methods used in meat analysis are briefly reviewed, including histochemical methods, e.g. fluorescent antibody technique for location of macromolecules (e.g. collagens), radioactive tracer technique, analytical electron microscopy for identifying foreign substances (e.g. Cd, Pb, Hg), and methods of flavour analysis, e.g. vacuum distillation, combined steam distillation with solvent extraction (e.g. for elucidating disinfectant-like off-flavour i.e. 2-methyl-6-chlorophenol, in pork) and MS-GLC. RM

210

Synthesis of flavonoid glycosides. IX. Relationship between the structure and taste of some naringin analogs.

Esaki, S.; Konishi, F.; Kamiya, S.

Agricultural and Biological Chemistry 43 (2) 231-235 (1979) [18 ref. En] [Food Chem. Lab., Shizuoka Women's Univ., Yada 409, Japan]

3 analogues of naringin, naringenin-7-[0- α -L-rhamnopyranosyl-(1-2)- β -D-glucopyranoside], were synthesized to investigate the role played by the rhamnose methyl group and the sugar-sugar link in the intense bitter flavour of naringin. α -L-rhamnose was replaced in (i) by 6'-O-methyl- α -L-mannose and in (ii) by 6'-O-methyl- α -D-mannose. In (iii) the (1-2)-glucoside portion was replaced by (1-6)- β -D-galactopyranoside. The synthesized analogues were also compared with narirutin, the (1-6) isomer of naringin. Bitterness of (i)-(iii) and narirutin, relative to naringin, was 0.10, 0.13, 0.08 and 0.05, resp. Non-methylated versions of (i) and (ii) were 0.04 and 0.01 × as bitter as naringin, resp. It is concluded that the rhamnose methyl group is essential for intense bitterness, and although bitterness is considerably decreased by conversion of the (1-2) link to (1-6), it is not completely abolished. [See FSTA (1978) 10 12T469 for part VII.] DIH

211

Flavor symposium on natural vs. artificial.

[Conference proceedings.]

United States of America, Society of Flavor Chemists, *Perfumer & Flavorist* 3 (4) 1-40 (1978) [En]

The following lectures were given at the flavor symposium held on April 13, 1978 at the Sheraton Hotel, Newark Airport: Statistical references to the world's agricultural and nutritional inadequacies, by G. L. ... (pp. 1, 3); The implementation for the food and flavor industry of shortages and dependence on climate conditions, by A. J. C. Peill (pp. 3-9); Consumer's view by N. H. Steorts (pp. 9-10, 13-14); Toxins, aflatoxins, natural toxicants and antinutrients in foods. Safety data required for food additives, by R. Hall (pp. 14-20); Flavorist's point of view, by J. Broderick (pp. 20-24); Food technologists point of view, by P. Hopper (pp. 24-26). The lectures were followed by a panel discussion with R. D. McCormick acting as moderator (pp. 26-32, 37); and a keynote address: There is more to taste than meets the nose, by M. R. Kare (pp. 38-40). RM

212

Analysis of essential oils by gas chromatography and mass spectrometry. [Book]

Masada, Y.

ix + 334pp. ISBN 0-470-15019-X (1976) [many ref. En] Chichester, UK; John Wiley & Sons Ltd. Price £34.80 [Dep. of Pharmaceutical Chem., Kyoto Coll. of Pharmacy, Kyoto, Japan]

This is a comprehensive work giving essential information (origin, name in Latin and other languages, physical and chemical constants, chemical components, bibliography, etc.) on 64 essential oils of 20 different families. A very useful addition is the incorporation of relevant chromatograms and mass spectra (all indexed separately). The publication is well produced and comprises a major source of information on essential oils. HBr

213

Studies on flavor components in shoyu. IV. Shoyu (soy sauce) volatile flavor components: basic fraction.

Nunomura, N.; Sasaki, M.; Asao, Y.; Yokotsuka, T. *Agricultural and Biological Chemistry* 42 (11) 2123-2128 (1978) [23 ref. En] [Cent. Res. Lab., Kikkoman Shoyu Co. Ltd., 399-Noda, Noda-shi, Chiba-ken 278, Japan]

Volatile basic fraction concentrates were prepared from heated and raw shoyu, separately. Each concentrate was successively analysed by combined GLC-MS. In the above 2 concentrates, 35 compounds were identified, 27 of which have not been reported previously for their presence in shoyu. The identified compounds were 24 pyrazines, 5 pyridines, 2 oxazoles and 4 other compounds. Furthermore, the basic compounds of both heated and raw shoyu were quantitatively analysed by GLC, and the concn. and odour units [concn./odour threshold] of major pyrazines which contained simple alkyl groups as the side chain were also determined. Consequently, the quantity of the basic compounds was found to increase during pasteurization; especially the total quantity of the

pyrazines increased markedly. Therefore, it is concluded that these confirmed pyrazines which have low odour threshold values play an important role in the so-called 'heated' flavour which is brought about by pasteurization of raw shoyu in the course of production. In addition, organoleptically, the basic compounds are considered to be indispensable to the shoyu flavour. [See FSTA (1979) 11 6T292 for part III.]

4
Essential oils and flavour materials. [Review]
Bedoukian, P. Z.

Flumer & Flavorist 3 (2) 1, 3-10, 14-16, 19-22, 24-28 [255 ref. En] [Bedoukian Res. Inc., Danbury, Connecticut, USA]
This review discusses the year's publications on research in essential oils and flavours, e.g. tea and coffee, terpenoids, S compounds as flavour enhancers, cheese and other flavour, vegetable and fruit flavours, interesting reports on various flavours, review articles and books.

5
Essential oils and related products. [Review]
Bertson, G.; Koenig, R. T.
Analytical Chemistry 51 (5) 183R-196R (1979) [481 ref. En] [Fritzsch Dodge & Olcott Inc., New York, New York 10011, USA]
This review of literature on the analysis of essential oils and related products covers the period from Sept. 1976-Aug. 1978. AL

16
Proceedings of the 3rd symposium on aroma substances in foods, held 3-4 February 1977, in Banska Bystrica, Czechoslovakia. [Conference proceedings]
Slo, V. (Czechoslovakia, Slovenska Spolocnost' pre Potravinarske, Lesnicke a Potravinarske Vedy pri SAV; Czechoslovakia, Slovenska Chemicka Spolocnost' pri SAV, Odborna Skupina pre Potravinarsku a Agrikulturnu Chemu; Czechoslovakia, R. SVTS pre Potravinarsky Priemysel v Banskej Bystrici)
3pp. (1977) [many ref. Sk, Cs] Bratislava, Czechoslovakia; Slovenska Vysoka Skola Technicka
10 papers from this symposium are abstracted separately and appear in the author index under Czechoslovakia, Slovenska Spolocnost' pre Potravinarske, Lesnicke a Potravinarske Vedy pri SAV [Aroma Substances Symposium]. FL

217
Partition coefficients for acetates in food systems.
Kieckbusch, T. G.; King, C. J.
Journal of Agricultural and Food Chemistry 27 (3) 504-507 (1979) [13 ref. En] [Dep. of Chem. Eng., Univ. of California, Berkeley, California 94720, USA]
Flame-ionization gas chromatography was used to determine equilibrium partition coeff. for C1-C5 alkyl acetates at high dilution between air and water, aqueous solutions of various carbohydrates, vegetable oils, and

mineral oil. A modified sampling and injection technique was used to overcome sorption effects for vapour samples. Measurements were made over a range of temp. from 25 to 50°C. Partition coeff. between air and solutions of sucrose, maltose, and dextran (M_r 90 000) increased sharply with increasing dissolved-solids content. For disaccharide solutions this could be attributed qualitatively to loss of free water due to hydration of sugar molecules. For solutions of maltodextrin, dextrin, and coffee solids, the acetates were held in solution more at higher dissolved-solids contents, and the partition coeff. for pentyl acetate actually decreased with increasing concn. of dissolved solids. Partition coeff. between air and the oils were much lower and indicated an activity coeff. of about 0.7 for the acetates in coffee and peanut oils. AS

218
Novel technique for the analysis of volatiles in aqueous and nonaqueous systems.
Legendre, M. G.; Fisher, G. S.; Schuller, W. H.; Dupuy, H. P.; Rayner, E. T.
Journal of the American Oil Chemists' Society 56 (5) 552-555 (1979) [12 ref. En] [Sci. & Education Administration, USDA, PO Box 19687, New Orleans, Louisiana 70179, USA]

A simple, efficient, external inlet assembly is described for analysing volatile components in raw and processed foods by direct gas chromatography and MS. The device comprises 3 sections: a sample inlet, a condenser, and a 6-port rotary valve. The versatility and effectiveness of this assembly are demonstrated by analysis and identification of volatiles from diverse food products (salad oils, vinegar, and corn-soy food blends). The procedure is rapid, efficient, and offers the following desirable features: it is compatible with all commonly used chromatographs and can accommodate samples of different size; sample volatiles are obtained without use of prior enrichment techniques, at ambient or elevated temp.; uniform heating enhances volatiles elution, thereby improving sensitivity; moisture and air are removed to facilitate mass spectral analysis; and the closed nature of the system minimizes loss of low mol. wt. volatiles during elution, thus producing a highly reliable profile of volatiles. AS

219
Spectroscopy in the LC analysis of foods.
Shumaker, W. E.; Yost, R. W.; Olson, D. C.
Abstracts of Papers, American Chemical Society 177 (1) AGFD 2 (1979) [En] [Perkin-Elmer Corp., Main Avenue, Norwalk, Connecticut 06856, USA]

Until now, use of spectroscopic techniques such as absorbance ratioing, has been limited because of the problems associated with data collection and manipulation. Detection and identification of liquid chromatographic peaks is made significantly easier through the use of more sensitive detectors and the collection of more data points for such techniques. This paper discusses the use of absorbance ratioing and wavelength scanning as they can be used for routine detn. of peak identity and purity. The technique's applicability is illustrated for vitamins, pesticides, amino acids and essential oils. AS

220

Composition of neutral volatile constituents in grape brandies.

Schreier, P.; Drawert, F.; Winkler, F.

Journal of Agricultural and Food Chemistry 27 (2) 365-372 (1979) [37 ref. En] [Inst. für Lebensmitteltech. & Analytische Chemie der Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

Neutral volatile constituents in (i) French and (ii) German grape brandies, and (iii) French cognacs were investigated by gas chromatography (GC) and coupled GC-MS. Using standard controlled aroma separation by liquid-liquid extraction, prefractionation of silica gel, and identification by MS, 139 neutral volatile compounds were quantitatively determined by GC. Clear quantitative differences existed between the amounts of some aroma constituents of (ii) and (i) as well as (iii). Mean values and ranges of individual components are given for (i), (ii) and (iii). Quantitative differences within the groups caused by different technologies of grape brandy production are discussed. AS

221

[Extractor designed to make extracts and juices on boiling under vacuum.]

Vasilik, I. N.

Fermentnaya i Spirtovaya Promyshlennost' No. 2, 20-21 (1979) [7 ref. Ru] [Ukrlikervodka, USSR]

Rendering of extracts and juices may be intensified by extraction involving boiling under vacuum. Preliminary vacuum-processing of raw material for 7-10 min, heating it to 40°C and boiling under vacuum considerably improved extraction, reduced ethanol losses and improved sensory properties of the intermediate products; extraction time could be reduced 4-fold; 15-20% increase in extractable substances was obtained, and ethanol losses were halved. STI

222

The volatile constituents of tea. [Review]

Howard, G. E.

Food Chemistry 4 (2) 97-106 (1979) [32 ref. En] [TPI, 56-62 Gray's Inn Road, London WC1X 8LU, UK]

This paper reviews the chemistry of the volatile constituents of black tea with special reference to their origin and the influence of climate, differences between cv. and processing on their cultivation. The information is discussed with the object of assessing the way in which some of the volatile compounds effect the flavour of tea. Attention is drawn to gaps in present knowledge. AS

223

[Testing the sensitivity of a colorimetric method for determination of the volatile acidity of wines.]

Niola, I.; Stefanelli, C.; Vallettrisco, M.

Industria delle Bevande 8 (2) 102-104 (1979) [3 ref. It, en] [Istituto di Mercologia, Univ. degli Studi di Napoli, Naples, Italy]

A study was conducted to evaluate the sensitivity of the colorimetric method of Florica et al. [see FSTA

(1977) 9 11H1836] for detn. of the volatile acid content of wines; results determined by this method were compared with those determined by the Italian Standard distillation/titration method. A table of comparative data is given for 20 wine samples and 1 commercial grape anthocyanin sample. The results show fairly good agreement between the 2 methods for acidity values greater than approx. 0.6 g acetic acid/L. At lower acidities, the colorimetric method gave appreciably lower values than the official method, the difference increasing with decreasing acidity. Use of correction factors for results determined by the Italian colorimetric method is recommended. AJDW

224

The analysis of the volatile components in Canadian wine.

Jackson, A. H.

Dissertation Abstracts International, B 38 (11) 5318 (1978) [En] [McMaster Univ., Hamilton, Ontario, Canada]

A new technique for the rapid quantitative analysis of the volatile components of wine involves use of a low-temp. vacuum concentrator and of a newly designed solvent extractor of improved efficiency. The technique was used to study, as a function of the fermentation process, the patterns of formation of volatile components in Concord and Blue Hybrid wines; effect of fermentation temp. on the patterns was also investigated. A number of the volatile components were identified on the basis of gas chromatographic retention times and MS data. JA

225

[Volatile constituents of a sherry wine. Identification of acetals derived from glycerol.]

Etievant, P.

Lebensmittel-Wissenschaft und -Technologie 12 (1) 115-120 (1979) [27 ref. Fr, en] [Sta. de Tech. des Produits Vegetaux, INRA, Cent. de Recherches de Dijon, 7 Rue Sully, BV 1540, 21034 Dijon Cedex, France]

4 compounds from a flor sherry wine (vin jaune du Jura) were isolated by chromatography on silica-gel and identified as 5-hydroxy-2-methyl-1,3-dioxanes (cis and trans) and 4-hydroxymethyl-2-methyl-1,3-dioxolanes (cis and trans). For this purpose, MS, IR and NMR spectrometry were used. These acetals are found to be natural products derived from glycerol and acetaldehyde, and are odourless. AS

226

[Results of gas chromatographic-mass-spectrometric investigations of volatile components of apple brandies.] Ergebnisse von gaschromatographisch-massenspektrometrischen Untersuchungen der flüchtigen Inhaltsstoffe von Apfelbränden. Woidich, H.; Pfannhauser, W.; Eberhardt, R. *Mitteilungen Klosterneuburg, Rebe und Wein, Obstbau und Fruchteverwertung* 28 (2) 56-63 (1978) [17 ref. De, en, fr] [Forschungsinstit. der Ernährungswirtschaft, Blaasstrasse 29, A-1190 Vienna Austria]

tile components of calvados and cider brandy of Olden Delicious and Gravensteiner were analysed by LC-MS system using packed columns with stationary phases OV-17 and Carbowax 20 M. The mass spectra of carboxylic acids, and of their esters, phenols, alcohols, and acetals are discussed. Special attention is given to identification of isopropyl ethoxypropane. The ciders of these cv. were analysed. AS

Aroma compounds in Williams pear brandy: analysis by capillary chromatography and mass spectrometry. [Untersuchung von Aromastoffen aus Birnen-Branntwein mittels Gaschromatographie und Massenspektrometrie. Eich, H.; Pfannhauser, W.; Eberhardt, R. *Lebensmitteluntersuchungen Klosterneuburg, Rebe und Wein, Weinbau und Fruchterverwertung* 28 (3/4) 112-117 (1983) [17 ref. De, en, fr] [Forschungsinstitut der Landwirtschaft, Blaasstrasse 29, A-1190 Vienna, Austria]

Aroma constituents of Williams pear brandy were separated by extraction and separated by capillary chromatography, with identification by MS. Many compounds were found, some of which have not been previously reported in this brandy. Aroma compounds previously identified in ripening pear were also found in the distillate. AS

8

Volatile composition of certain Amazonian fruits. Jennings, S.; Jennings, W. G. *Food Chemistry* 4 (2) 149-159 (1979) [14 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

Volatile constituents of several Amazonian fruits (cupuacu, maruci and tapereba) were isolated by steam distillation-extraction of pulp or juice from the green fruits. Essences were subjected to GLC analysis using high resolution wall-coated open tubular glass capillary columns; identification of the volatile components was based on MS analysis supported by GC retentions under linearly temp.-programmed conditions. Considered individually, none of the compounds identified duplicated the aroma of any of these fruits. Many of them do, however, contribute to the typical notes. This indicates that the typical aroma of an individual fruit is due not to one compound but is probably the result of an integrated response to the distribution of a wide spectrum of compounds. AS

29

Technological improvement of soft fruit.

Donzini, A. *Annali dell'Istituto Sperimentale per la Valorizzazione Tecnologica dei Prodotti Agricoli* 8, 317-328 (1977) [It, en] [IVTPA, Milan, Italy]

This report deals with processing of (i) raspberries, (ii) blackberries and (iii) blackberries. The following procedures are considered: extraction of aroma compounds from (i) involving alcohol treatment or alcoholic fermentation, and a similar but simpler

treatment of (iii) being described and illustrated by flow sheets; solid pack packaging of (ii) and (iii); (i)-(iii) juice production, including use of pectolytic enzymes with (ii); jam preparation; and extraction of different pigments. SKK

230

Nonacidic constituents of volatiles from cooked mutton.

Nixon, L. N.; Wong, E.; Johnson, C. B.; Birch, E. J. *Journal of Agricultural and Food Chemistry* 27 (2) 355-359 (1979) [26 ref. En] [Dep. of Sci. & Ind. Res., Applied Biochem. Div., Palmerston North, New Zealand]

The nonacidic volatiles from cooking mutton were analysed by gas chromatography-MS, both as ether extracts and by adsorption onto porous polymer traps. Of the 93 compounds identified (some tentatively), 56 have not previously been reported in volatiles from cooked ovine tissues and 15, including the new compound 3,6-dimethyl-1,2,4,5-tetrathiane, have not been previously identified in cooked meats. AS

231

Contribution to the study of french bread aroma.

Influence of breadmaking procedure on the composition of the crumb volatile compounds. [Thesis; Contribution a l'etude de l'arome du pain francais. Influence du mode de panification sur la composition en constituants volatils de la mie, 68pp. Fr] Nago, C. M.

Dissertation Abstracts International, C 38 (2) 213 (1977/1978) [En] [Univ. de Paris VII, Paris, France]

48 components isolated from French bread were identified by gas chromatography/MS, measurement of retention times and detn. of specific reaction of functional groups; ethanol comprised >96% of this volatile fraction. 2-methyl propanoic and 3-methyl butanoic acid contents varied considerably in the crumb, depending on the type of breadmaking process used (conventional, sponge-dough, sour-dough). These acids appeared to give an unpleasant note to the crumb aroma (to which approx. 20 compounds appeared to contribute). High speed mixing and incorporation of horsebean flour are not recommended. HBr

232

[Volatile substances formed in lipid oxidation and some of their subsequent reactions.] (In 'Zbornik prednasok z III. celostatneho Sympozia o aromatickych latkach v pozivatinach' [see FSTA (1979) 11 11A775]) [Lecture]

Dostalova-Jirousova, J.; Davidek, J. pp. 10-16 (1977) [12 ref. Cs] [Katedra Chem. a Zkouseni Potravin, Vysoke Skola Chem. Tech., Prague, Czechoslovakia]

Results of sensory tests on volatile substances formed during storage of materials such as casein or cellulose with different aldehydes in the proportion of e.g. 20 mg aldehyde/g casein at 60°C in the presence of 5 or 50% water and in the absence of light are quoted from the detailed publication in Sbornik Vysoke Skoly Chemicko-Technologicke v Praze, E (Pokorny et al.) —

in press. Among the main conclusions were: volatile aldehydes are the main source of the rancid odour of fats in foods; during heating or long-term storage of foods, they may react with proteins with formation of sensorily inactive or less active products; and in protein/aldehyde mixtures, a rectilinear relationship was found between odour and colour intensity organoleptically assessed. SKK

233

Flavor: its chemical, behavioral, and commercial aspects. [Book]

Apt, C. M. (Editor)

xv + 229pp. ISBN 0-89158-223-9 (1978) [many ref. En] Boulder, Colorado, USA; Westview Press Inc. Price £16.50

Papers presented at the Arthur D. Little, Inc., Flavour Symposium, 1977, review significant current research in flavour technology. Various authors discuss why food tastes the way it does, how its flavours affect us, and the critical role of flavour in the marketplace. Chapters on chemistry describe new analytical techniques for the isolation of flavour compounds. The book is divided into 3 sections: The chemistry of flavor (pp. 9-76); The behavioral aspects of flavor measurement (pp. 79-159); and The commercial world of flavor (pp. 163-222). Chapters included are: Introduction to the chemistry of flavor, by C. M. Apt (pp. 9-11, 6 ref.). The role of analytical chemistry in flavor creation, by C. J. Mussinan (pp. 13-30, 11 ref.). Flavor Characteristics of synthetic cooling compounds, by H. R. Watson (pp. 31-50, 8 ref.). Molecular aspects of sweet taste, by G. A. Crosby, G. E. DuBois & R. E. Wingard, Jr. (pp. 51-66, 12 ref.). Interactive flavor influence of some materials in different foods and beverages, by W. A. Hardwick (pp. 67-76, 12 ref.). Introduction to the behavioral aspects of flavor measurement, by C. Pfaffmann (pp. 79-87, 6 ref.). Flavor and the neural organization of feeding behavior, by R. Norgren (pp. 89-100, 19 ref.). The use of characteristic flavorings in human culinary practice, by P. Rozin (pp. 101-127, 79 ref.). Social psychological considerations in flavor measurement, by D. H. Walsh (pp. 129-147, 26 ref.). Statistical treatment of flavor data, by I. Miller (pp. 149-159). Introduction to the commercial world of flavor, by R. N. Frank (pp. 163-165). Flavor and the bottom line, by J. M. Fox (pp. 167-174). Growth of an industry, by F. W. Schubert (pp. 175-187). Marketing to the consumer, by K. A. Wall (pp. 189-195). Man and food, by J. F. Angeline (pp. 197-206, 4 ref.). World food security: closing the gap between what is and what should be, by D. H. Wood (pp. 207-222, 4 ref.). VJG

234

G.l.c. study of the essential oil of wild cardamom oil of Sri Lanka.

Rajakpase-Arambewela, L. S.; Wijesekera, O. B. *Journal of the Science of Food and Agriculture* 30 (5) 521-527 (1979) [11 ref. En] [Natural Products Section, Ceylon Inst. of Sci. & Ind. Res. (CISIR), PO Box 787, Colombo 7, Sri Lanka]

Volatile oil steam-distilled from wild cardamoms was analysed by GLC and several significant differences

from the expressed oil and the oil of other var. of cardamom were observed, e.g. cold-pressed wild cardamom oil contained no p-cymene whilst steam-distilled oil contained a high percentage. Thujene and cis-p-2-menthen-1-ol are constituents reported for the 1st time. AS

235

[Low molecular weight ingredients of smoke flavour preparations.] Niedermolekulare Inhaltsstoffe von Raucharoma-Präparaten.

Baltes, W.; Söchtig, L.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 169 (1) 9-16 (1979) [21 ref. De, en] [Inst. für Lebensmittelchem. der Tech. Univ. Berlin, Müller-Breslau-Strasse 10, D-1000 Berlin 12]

12 commercially available smoke flavour preparations were analysed by steam distillation and GLC/MS of the steam distillate. Thin film glass capillary columns with Carbowax 20 M TPA gave good separation of aroma ingredients if the glass surface was deactivated prior to coating. 70 aroma compounds were identified, 22 for the first time in smoke flavour preparations. MS data for these 22 compounds are tabulated. The 16 most important phenolic compounds were quantitatively determined; amounts found (in mg/kg) in the 12 preparations are tabulated. Guaiacol was a consistent component of the preparations (24-5869 mg/kg), as was 2,6 dimethoxyphenol (syringol, 37-9609 mg/kg). Sensory evaluations of these 2 compounds and 5 other phenolic compounds are tabulated. DIH

236

GC and GC-MS analysis of headspace volatiles by Tenax GC trapping techniques.

Tsugita, T.; Imai, T.; Doi, Y.; Kurata, T.; Kato, H.

Agricultural and Biological Chemistry 43 (6) 1351-1354 (1979) [10 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Bunkyo-ku, Tokyo, Japan]

A headspace volatile collection procedure that avoids the use of a cold trap is described. Headspace volatiles are trapped on Tenax GC (60-80 mesh) packed in an L-shaped glass tube, either by injection or by flushing volatiles from dried or aqueous systems with N₂ through the tube. Volatiles are then injected into GLC systems by heating the tube to 200°C and back-flushing with carrier gas. Gas chromatograms obtained with a model system and with ground roasted soybeans and cooked rice are illustrated. High b.p. components are recovered by the technique, which is simple and rapid. DIH

237

[Formation of aroma substances by means of the Maillard reaction.] Bildung von Aromastoffen durch Maillardreaktion.

Tressl, R.

Monatsschrift für Brauerei 32 (5) 240-246, 248 (1979) [43 ref. De, en, fr] [Lehrstuhl für Chem.-tech. Analyse, Tech. Univ., Berlin]

The significance of Maillard reactions for formation of aroma and flavour compounds is discussed with the

diagrams, structural formulae, etc. Aspects included include: formation of furans, caramel components, amines, pyrazines and aldimines; formation of aroma components from Strecker aldehydes; and formation of heterocyclic N compounds proline and hydroxyproline. TUB-IGB

Progress in the gas chromatographic determinations of carbonyls and other volatiles in beer. Postel, W.; Gheluwe, G. van. *Journal of the American Society of Brewing Chemists* 35 (1978) 73-76 (1977) [8 ref. En] [Molson Breweries of Canada Ltd., Montreal, Quebec, Canada H2L 2R5] In this paper, the 5th in a series covering the formation, identification, and identification of 2-nonanal reports some of the difficulties encountered in developing a quantitative method of analysis for carbonyls in beer. Included are observations on direct injection, purging, sample and solvent purification, artifact formation and sample instability. The results from these observations are incorporated in a refined procedure which offers simplification of the apparatus, the use of a more reliable internal standard (2-octanone), and improvements in the method of recovery. Several compounds were identified by gas chromatography/MS, including 2 which are peculiar to physically and organoleptically unstable beer. [See A (1976) 8 2H242.] AS

9

Gas phase ionic acetylation of esters using 2,3-butanedione. II. Gas chromatographic and mass spectrometric studies of the volatile components of North American grape juice and wine. Postel, W.; Gheluwe, G. van. *Dissertation Abstracts International, B* 39 (1) 196: 78-10430, 255pp. (1978) [En] [Univ. of North Carolina, Chapel Hill, N. Carolina 27514, USA] Part I of this thesis describes the gas phase ionic acetylation of a series of 16 esters, 2,3-butanedione being used as acetylating agent. In part II, consideration is given to methods for determining trace (p.p.m. levels) volatile components in aqueous and aqueous-alcoholic media. Conversion of an Hitachi RMU-GE mass spectrometer into a system capable of accepting a flow of 1 ml/min from a gas chromatograph with a resulting analyser pressure of 2×10^{-6} torr and an estimated sensitivity of 180 ng for acetone is described, together with a procedure for producing uniformly coated support coated open tubular glass columns for use in capillary GLC. Dichloromethane is preferred for extraction of grape juice and wine on the basis of extraction efficiency and storage stability; Freon 11 is better on the basis of efficiency alone. Electron impact and chemical ionization GLC/MS analyses of (i) Aurora wine, (ii) Concord grape juice and (iii) Concord wine indicated small qualitative differences between the varieties. Major components were ethyl lactate and phenylethanol in (i) and 3-methyl-1-butanol and phenylethanol in (iii). Methyl anthranilate was present in (ii) and (iii) but not detected in (i). 2 lactones were identified in (i) and (iii) but none in (ii). JA

240

[Gas chromatographic characterization of whisky. III. Irish whiskey.] Gaschromatographische Charakterisierung von Whisky. III. Irischer Whisky. Postel, W.; Adam, L.

Branntweinwirtschaft 118 (23) 404-407 (1978) [9 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Volatiles in 7 Irish whiskeys were analysed by GLC; 7 carbonyl compounds, 11 alcohols and 21 esters were identified. Considerable differences in contents of these volatiles were observed; total volatiles content ranged from 185-502 mg/100 ml pure ethanol. The potential for classification of Irish whiskeys into types on the basis of their volatiles concn. is discussed. 3 types could be distinguished: 'light' pot-still/patent-still whisky blends, with relatively low concn. of higher alcohols and esters; pure pot-still whiskeys, with high concn. of volatiles; and Northern Irish pot-still whiskey/grain whiskey blends (similar to blended Scotch whiskeys with a high to very high malt whisky content), with fairly high concn. of higher alcohols and esters. [See FSTA (1978) 10 1H33 for part II, and following abstr. for part IV.] AJDW

241

[Gas chromatographic characterization of whisky. IV. USA and Canadian whisky.] Gaschromatographische Charakterisierung von Whisky. IV. US-amerikanischer und kanadischer Whisky. Postel, W.; Adam, L.

Branntweinwirtschaft 119 (10) 172-176 (1979) [23 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Gas chromatographic studies on 22 USA straight Bourbon whiskeys and 8 Canadian blended whiskeys are described; tables of data (mean values and ranges) are given for concn. of volatile compounds. The USA whiskeys were very rich in volatiles; 10 carbonyl compounds, 13 alcohols and 25 esters were identified. Mean total volatiles concn. was 565 mg/100 ml pure alcohol, of which higher alcohols comprised 444 mg/100 ml pure alcohol (isoamyl alcohol 321 mg/100 ml pure alcohol), and esters comprised 82 mg/100 ml pure alcohol. The mean concn. of esters other than ethyl acetate was 13 mg/100 ml pure alcohol. The Canadian whiskeys had relatively low volatile compound concn.; only 7 carbonyl compounds, 11 alcohols and 16 esters were identified. Average total volatile compound content was 98 mg/100 ml pure alcohol, of which 57 mg/100 ml was higher alcohols, and 20 mg/100 ml was esters. The concn. of esters other than ethyl acetate was only 3.3 mg/100 ml pure alcohol. [See preceding abstr. for part III.] AJDW

242

Nuclear magnetic resonance spectroscopy of the aromatic region of beer extracts. Belleau, G.; Dadic, M.

Journal of the American Society of Brewing Chemists 35 (4) 191-196 (1977) [4 ref. En] [Molson Breweries of Canada Ltd., Montreal, Quebec, H2L 2R5, Canada]

The application of NMR spectroscopy to the investigation of beer aromatic components is suggested due to a low field resonance of such compounds vs. the resonance of other major beer constituents. Extracts of aromatic beer constituents suitable for NMR analysis are prepared using ethyl acetate. Deuterated methanol is used as the NMR solvent and the spectra are recorded both at 500 Hz and with the expansion of 50 Hz and a sweep offset of 380 Hz. The chemical shifts of the major aromatic components, as well as their integration values, are recorded for various types of beer, both fresh and aged. The forcing (heating at 60°C) kinetics of beer is established as a possible parameter for its fingerprinting as to type and age. A novel method for approx. detn. of the monomeric catechins in beer extract, using NMR, was developed as an additional parameter in beer fingerprinting and quality monitoring. AS

243

Inhibition of beer volatiles formation by carbon dioxide pressure.

Rice, J. F.; Chicoye, E.; Helbert, J. R.; Garver, J. *Journal of the American Society of Brewing Chemists* 35 (1) 35-40 (1977) [24 ref. En] [Miller Brewing Co., Milwaukee, Wisconsin, USA]

The formation of total volatiles and yeast growth were inversely related to the CO₂ counterpressure applied during 100 l fermentations. However, the rate of fermentation was relatively unaffected. Thus 8 lb/in² gauge CO₂ counterpressure in a 22°C fermentation repressed both total yeast growth and total volatiles concn. to the levels present in a 15°C fermentation with 0 lb/in² gauge CO₂ counterpressure. The repression of individual volatile compounds, however, was not uniform. The influence of temp., agitation and CO₂ count erpressure upon the dissolved CO₂ concn. during active fermentation was quantified. It was shown that the degree of supersaturation (termed the supersaturation coeff.) which is the ratio of the dissolved CO₂ concn. during active fermentation to the CO₂ saturation level, was constant over the ranges of temp. and CO₂ counterpressure examined at constant agitation. The supersaturation coeff. varied inversely and in a linear manner with agitation. At sufficiently high agitation, no CO₂ supersaturation existed during active fermentation, thus the supersaturation coeff. was 1.0. AS

244

Method of making an improved tea volatiles concentrate.

Gregg, R. (Procter & Gamble Co.) *United States Patent* 4 130 669 (1978) [En]

Process contacts wet ground tea with water vapour at reduced pressure in a fluidized state to yield a volatiles-laden vapour which is freeze condensed. The frozen volatiles are then converted into a liquid concentrate by contact with an aqueous tea extract with a solids content of 15-65%. IFT

245

Scotch whisky, past, present and future.

Rose, A. H.

Brewers' Guardian 108 (3) 43, 45, 47 (1979) [29 ref. En]

The history of whisky production is briefly reviewed and current research on the ethanol tolerance of whisky yeasts is discussed in outline, with some reference to flavour research. JRR

246

[Investigation of the aroma substances of hops, their behaviour during storage and fermentation, and their contribution to the aroma of beer.] Untersuchung von Hopfenaromastoffen, ihr Verhalten während Lagerung und Gärung und ihr Beitrag zum Bieraroma.

Friese, L.; Fendesack, F.; Tressl, R.

Monatsschrift für Brauerei 32 (5) 255-259 (1979)

[24 ref. De, en, fr] [Forschungsinst. für Chem.-tech. Analyse, Versuchs- & Lehranstalt für Brauerei, Berlin]

By means of adsorption chromatography/capillary gas-chromatography/MS, the behaviour of some aroma substances of hops was investigated. During storage of hops, conversion of terpene and sesquiterpene hydrocarbons into the corresponding epoxides and alcohols takes place. The yeast adsorbs the aroma substances of the hops according to their lipophilic/hydrophilic character. > 30 oxygen-containing terpene and sesquiterpene components could be identified in 2 hop-aromatic beers by gas chromatography and MS and could be determined according to their order of magnitude. Hop-aromatic beers contain higher % of cyclic ethers, such as hop ether and carahana ether, as well as epoxides and alcohols, the structure of which is derived from humulene and caryophyllene. TUB-IGB

247

[Aroma substances of malt and their contribution to the aroma of beer.] Aromastoffe des Malzes und deren Beitrag zum Bieraroma.

Kossa, T.; Bahri, D.; Tressl, R.

Monatsschrift für Brauerei 32 (5) 249-252, 254 (1979)

[44 ref. De, en, fr] [Forschungsinst. für Chem.-tech. Analyse, Versuchs- & Lehranstalt für Brauerei, Berlin]

> 100 aroma substances in pale and dark malts were characterized and semi-quantified by gas chromatography and MS, including aliphatic aldehydes and alcohols resulting from oxidation of lipids, as well as furanes, pyrroles and pyrazines resulting from the Maillard reaction during kilning. In addition, the thermal fragmentation of p-coumaric and ferulic acids leads to phenols influencing the odour and taste. Possible mechanisms of formation are shown for some components. TUB-IGB

248

Flavour of green tea.

Yamanishi, T.

JARQ (Japan Agricultural Research Quarterly) 12 (4) 205-210 (1978) [8 ref. En] [Food Chem. Lab.,

homizu Univ., 1-1 Otsuka, 2-Chome, Bunkyo-ku, Tokyo, Japan]

Aroma compounds identified from green tea are under the headings (number of compounds in theses): hydrocarbons (11); alcohols (29); aldehydes (5); ketones (11); esters (7); lactones (3); acids (9); miscellaneous oxygenated compounds (2); and nitrogenous compounds (26). The paper then deals with the aroma components of several distinctive green teas and their aroma characteristics. Green teas considered are: Sen-cha; Cha from special var. Sayamamidori; Kamairi-cha; Cha (roasted green tea); Vietnamese green tea (H-Mao tea, the best quality of Vietnamese tea); Oolong tea; Pouchong tea; and jasmine tea. VJG

3

Effect of cysteine on volatile development in dehydrated onions (*Allium cepa* L.).

Hadziyev, D.; LeMaguer, M.; Hadziyev, D.

Canadian Institute of Food Science and Technology Journal 12 (2) 43-46 (1979) [6 ref. En, fr] [Alberta Hort. Cent., Brooks, Alberta, T0J 0J0, Canada] The volatiles developed from dehydrated onion after rehydration with water or 1 g/l. cysteine solution were trapped on a porous polymer, Tenax-GC, and analysed by an on-column entrainment gas chromatography procedure. Rehydration temp. of 22-40°C, and 4 sampling-trapping times were investigated. Samples rehydrated with cysteine solution generally gave less total volatiles when the sampling-trapping period was 15, 30 and 60 min and more after than water rehydrated samples. Propionaldehyde, propanol and 1-propanethiol contents were always higher in samples rehydrated with water. The plausible reactions responsible for the observed effect of cysteine are discussed. AS

50

Quantitation of flavour notes in mango varieties. (In Proceedings of the First Indian Convention of Food Scientists and Technologists' [see FSTA (1979) 11 A871]) [Lecture]

Chandrapadhyay, C.; Gholap, A. S.

Journal of Food Science and Technology, 4, No. 1.3 (1979) [En] [Biochem. & Food Tech. Div., Babha Atomic Res. Cent., Bombay, India] Flavour volatiles of ripe fruits of 5 mango var. (phonso, langra, totapuri, rajapuri, neelum) were analysed by GLC. Fatty acid composition of fruit of the same var. was determined by GLC of the methyl esters. Phonso contained 12 flavour components (including methyl acetate, cis-ocimene, α - and β -pinene, and several lactones) while totapuri contained 8 (including propional, methyl acetate, β -myrcene, limonene, and γ -terpinene). Flavour characteristics of the fruit were related to ratio of palmitic acid to palmitoleic acid; this ratio ranged from 0.77 (langra) to 1.46 (totapuri). JA

51

Study of the aroma of conched and non-conched chocolate by gas chromatography.]

Armakova, T. P.; Bogod, L. M.

Khlebopekarnaya i Konditerskaya Promyshlennost' No. 2, 36-37 (1979) [Ru]

When the aromas of conched and non-conched chocolate were studied, additional concentrates of chocolate aroma were obtained which possess considerably different organoleptic properties. Comparison was made of the volatile components, using gas chromatography. A method of obtaining the aroma concentrate without using considerable amounts of solvents was devised. Organoleptic evaluation of chromatographic zones shows that the aroma-forming volatile compounds contain some which are not typical of the chocolate aroma. The mixture is so complex that the considerable number of constituents obscures the differences in composition of the volatile compounds. Thus classification of groups of substances should be the first step, followed by gas chromatographic study of these groups. STI

252

The identification of volatile constituents in sugarcane and cane sugar products. (In 'Proceedings of the 1978 Technical Session on Cane Sugar Refining Research' [see FSTA (1979) 11 12L784]) [Lecture]

Godshall, M. A.; Legendre, M. G.; Roberts, E. J. pp. 46-67 (1979) [28 ref. En] [Cane Sugar Refining Res. Project Inc., PO Box 19687, New Orleans, Louisiana 70179, USA]

A new method of direct elution of volatile compounds from cane sugar products avoids the elaborate conventional distillation/extraction procedures which may lose low mol. wt. compounds. A gas chromatograph is fitted with an external injection port (diagram given) and volatiles released by heating are eluted in a flow of He + water vapour to the gas chromatograph column. Their identity is confirmed by comparison with authentic compounds and in some cases by further examination using MS. Preparation of samples and operating details are described. The major investigation concerned the volatiles present in blackstrap molasses, in which 23 compounds were identified; these are listed together with chromatograms. Sensory evaluation was obtained by blowing out the detector flame as the chromatograph peak emerged and noting the odour. A few examinations were made of volatiles from sugar cane leaves, fresh cane juice and 2 raw sugars (1 with pleasant odour, 1 unpleasant yeasty) to study possible passage of volatiles from sugar cane through the manufacturing process. The strong 'grassy' flavour component characteristic of molasses and some sugar products (undesirable in white sugar) was contributed mainly by dimethylsulphide, which has a low flavour threshold (12 parts/billion) and is pleasant in low concn.; it is present in leaves in small amounts but large amounts are produced by heat treatments. The sweet, caramel component appears to be contributed by acetaldehyde, 2-methyl propanal, diacetyl, 2-methyl butanal, 2,3-pentanedione and 2-methyl-3-oxo-tetrahydrofuran. ELC

253

[Changes in free volatile fatty acids of sweet cream butter during storage.]

Ponomareva, G. S.; Makar'ina, N. V.; Vyshemirskii, F. A. *Trudy Vsesoyuznyi Nauchno-issledovatel'skii Institut Masloedel'noi i Syrodel'noi Promyshlennosti* No. 22 18-21 (1978) [Ru] [VNIIMiSP, Uglich, USSR]

Free volatile fatty acids obtained by steam distillation from sweet cream control, Lyubitel'skoe and Krest'yanskoe butters made from 1 bulk batch of pasture milk by phase inversion of high-fat cream (moisture contents, approx. 16, 20 and 25%, resp.) were examined by GLC when fresh and at intervals during storage for up to 12 months at -18°C . Initial contents were for the 3 types of butter, resp. (mg%): formic acid, 0.30, 0.26 and 0.26; acetic acid, 4.26, 3.83 and 3.85; propionic acid, 0.093, 0.082 and 0.089; and butyric acid, 0.85, 0.60 and 0.58. During storage, contents of total volatile fatty acids increased to a max. at 3 months of 5.5, 5.6 and 6.0 mg%, and then decreased to 4.0, 4.5 and 3.5 mg%, resp. at 12 months. Differences in plasma content had no marked effect on storage changes. SKK

254

Studies on flavour components in boiled crabs.

II. Nucleotides and organic bases in the extracts.

Hayashi, T.; Yamaguchi, K.; Konosu, S.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 44 (12) 1357-1362 (1978) [27 ref. En] [Lab. of Marine Biochem., Fac. of Agric., Univ. of Tokyo, Bunkyo-ku, Tokyo 113, Japan]

Nucleotides and organic bases were determined in extracts from the leg meat, hepatopancreas and ovary of 5 spp. of edible crabs in Japan. Adenosine 5'-monophosphate and cytidine 5'-monophosphate were the major nucleotides in these tissues. Guanosine 5'-monophosphate, uridine 5'-monophosphate, inosine 5'-monophosphate and adenosine 5'-diphosphate were also detected, together with several nucleosides and free bases in some or all samples. Nucleotide contents of the ovary were 3-5 times higher than those in other parts. The leg meat and hepatopancreas were rich in glycine, betaine and trimethylamine oxide, with somewhat lower levels of homarine. The ovary accumulated more homarine than the other parts. In most samples, >90% of the extractable N was accounted for by these constituents and the amino acids reported in part I [see FSTA (1979) 11 4R284]. JRR

255

Evaluation of ginger and pepper quality. (In 'Proceedings of the First Indian Convention of Food Scientists and Technologists' [see FSTA (1979) 11 12A871]) [Lecture]

Govindarajan, V. S.; Raghuveer, K. G.; Shanthi Narasimhan

p. 48, No. 4:12 (1979) [En] [Cent. Food Tech. Res. Inst., Mysore, India]

A newly developed TLC-aromagram method was used to obtain an aroma profile for ginger. The method involves TLC separation of the oleoresin and volatile oil using various solvents, selection of the aroma-

significant areas and simultaneous recording of aroma description. Dominant ginger notes were found in the oxygenated fractions. Results of the TLC-aromagram method showed good agreement with those obtained by taste panels. A method previously developed for subjectively evaluating pungency in chillies [see FSTA (1978) 10 6T244] was successfully applied to both ginger and pepper. Regression analysis indicated that the capsaicin and piperine contents of samples were correlated with the respective Scoville heat units. JA

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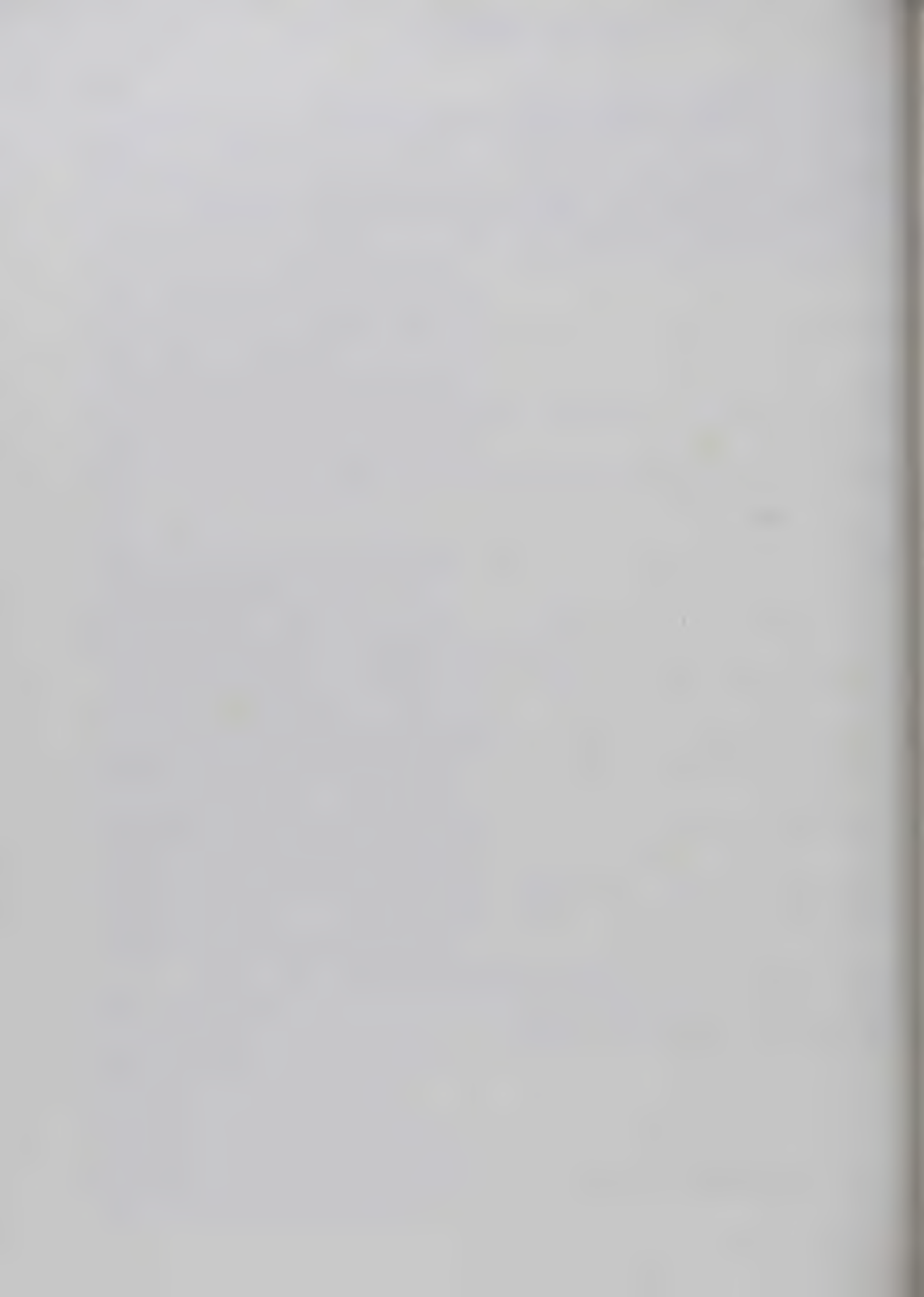
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H. BROOKES

EDITOR

ore coated columns for sampling and
tration of organic volatiles in air, headspace
ter analysis.

, D. A. M.; Hussein, M. M.

J. of Chromatography 176 (3) 291-303 (1979)
[En][Life Savers Inc., Port Chester, New York,

e-bore coated (LBC) columns have been proven
e in the concn. of volatiles from air and
ace volatiles. Application of the method to
s of peppermint oil is described. Direct sampling
ds on LBC columns is a promising area
ally for water pollution analysis and quality
l of flavours in beverages. AL

s on the analyses of sulphites in foods. I.
ation of gas chromatography for the separate
ination of free and combined sulphites in

no, T.; Mitsuhashi, Y.; Matsuki, Y.; Ikuzawa, M.;
K.; Izumi, T.; Adachi, T.; Nonogi, H.; Fuke, T.;
H.; Toyoda, M.; Ito, Y.; Iwaida, M.
*Zeitschrift für Lebensmittel-Untersuchung und
Hung* 168 (3) 195-199 (1979) [6 ref. En, de][Public
n Res. Inst. of Kobe City, Kano-cho 1-5, Ikuta-ku,
Japan]

rocedure for detn. of free and total sulphite in
is described. 20 mg comminuted samples of the
nder test are made up to 50 ml with either 0.1M
c acid solution (for extraction of free SO₂) or an
e NaOH/potassium sodium tartrate/FeSO₄
on (for extraction of total SO₂). The extracts are
ltered. 1 ml of either filtrate is mixed with 5 ml of
H₃PO₄ solution in a sealed tube, shaken vigorously
s and left to stand for 10 min, and 1 ml of the
pace gas is collected by means of a syringe and
sed by GLC on an APS-1000 (40/60 mesh) column
ame photometric detection. Recovery of free and
sulphites from model solutions was 98.5-101.5%;
od samples (dried pineapple, dried apricots, red
white wines), recovery of free sulphite was 92.5-
%, and that of bound sulphite was 93.5-98.0%.
ction limit is 0.5 p.p.m. (See following abstr. for part
AJDW

le and sensitive technique for detecting trace
ur components in beer.

ard, T. L.; Douse, J. M. F.

Journal of Chromatography 176 (3) 444-447 (1979)
[En][Brewing Res. Foundation, Nutfield, Redhill,
ey, UK]

er was vacuum-steam distilled at 25°C and 0.02 mm
ressure, the distillate passed through Amberlite
-2 porous polymer beads for 5 h, the resin eluted
diethyl ether and the extract analysed by GLC.
g this technique, S-containing compounds are
table with a flame photometric detector at the
parts/billion level, and with a flame ionization
ctor compounds which do not contain S are
table at the p.p.m. level. It is believed that the
od could be used to detect and quantify

S-compounds in a wide range of foods by emulsifying
samples in water prior to the initial vacuum steam
distillation step. AL

4

Mushrooms from head to foot flavourful.

Drüke, R. W.

H&R [Haarmann & Reimer] Contact No. 23, 11-15
(undated) [En]

Various types of edible fungi are described and their
nutritional value, their culinary use as flavourings and
seasonings for soups, sauces and meat juices, and the
manufacture of dried fungi discussed. The study of
fungal aromas, including the detn. of constituents of
their aromas and the desired changes in these produced
by domestic methods of preparation, and the
development of new flavours in the styles of fresh and
cooked mushrooms and the cooked cepes, are also
briefly described. SP

5

Flavor analysis of quince.

Schreyen, L.; Dirinck, P.; Sandra, P.; Schamp, N.
Journal of Agricultural and Food Chemistry 27 (4)
872-876 (1979) [25 ref. En][Fac. of Agric. Sci., Lab. of
Organic Chem., State Univ. of Ghent. Coupure 533,
Ghent, Belgium]

Quince (*Cydonia vulgaris*) essential oils were
obtained by steam distillation and by headspace
condensation and studied by a combination of capillary
GLC and MS. In the quince oil obtained by steam
distillation and subsequent continuous ether extraction,
79 components were identified. The essential oil,
obtained by headspace condensation had a pleasant
natural quince flavour and showed a much simpler
composition. Aromagrams indicated a lot of
organolectically important esters to be the base of the
fruity flavour, and ethyl 2-methyl-2-butenate was
recognized to be an important contributor to the typical
quince flavour. AS

6

**[Aroma substances in raspberries, cloudberries and
Arctic bramble.] [Review]**

Kallio, H.; Pyysalo, T.; Honkanen, E.

Livsmedelsteknik 20 (8) 389-391 (1978) [25 ref. Sv]

7

Volatile constituents of dried legumes.

Lovegren, N. V.; Fisher, G. S.; Legendre, M. G.; Schuller,
W. H.

Journal of Agricultural and Food Chemistry 27 (4)
851-853 (1979) [6 ref. En][S. Regional Res. Cent., Sci. &
Education Administration, USDA, New Orleans,
Louisiana 70179, USA]

7 samples of lima beans (*Phaseolus lunatus*),
5 samples of common beans (*Phaseolus vulgaris*),
2 samples of lentils (*Lens culinaris*), and one sample
each of mung beans (*Phaseolus aureus*), soybeans
(*Glycine max*), and split peas (*Pisum sativus*) were
analysed for volatile constituents by gas
chromatographic and MS techniques. Qualitatively, the
volatile constituents of these dry legumes were the

same as those found in soil fungi and there were only a few significant quantitative differences. However, the concn. of most constituents did not have normal distributions and could be divided into 2 or more groups with significantly different means. Low concn. of several aromatic and chlorinated hydrocarbons, including benzene and chloroform, were found in all samples, even one grown and analysed with little or no exposure to agricultural or laboratory chemicals. AS

8

[Wild mushrooms – an aromatic but neglected raw material.]

Pyysalo, H.

Livsmedelsteknik 20 (4) 186–187 (1978) [Sv]

Aroma compounds (16 alcohols, 21 carbonyls, 11 esters, 13 acids, 11 terpenes) found in Scandinavian mushrooms are listed, together with the odour thresholds of the 9 major aroma compounds found in wild (wood) mushrooms, and the type of smell they produce. HBr

9

Volatile constituents of some unifloral Australian honeys.

Graddon, A. D.; Morrison, J. D.; Smith, J. F.

Journal of Agricultural and Food Chemistry 27 (4) 832–837 (1979) [15 ref. En] [Dep. of Physical Chem., La Trobe Univ., Bundoora, Victoria 3083, Australia]

A study has been made of the volatile constituents of some unifloral Australian honeys, using a GLC-MS-computer system. The extracts of honey volatiles prove to be complex mixtures of at least 100 compounds. A surprising range of hydrocarbons and oxygenated compounds are present, some of which may be unique to the floral sources. AS

10

Determination of volatile N-nitroso compounds in various samples of edible vegetable oils and margarine (commercially available products).

Hedler, L.; Schurr, C.; Marquardt, P.

Journal of the American Oil Chemists' Society 56 (7) 681–684 (1979) [4 ref. En] [Pharmakologisches Inst. der Univ., Hermann-Herder-Strasse 5, D-78 Freiburg 1, Federal Republic of Germany]

Examination of samples of various commercially available vegetable oils (olive oil, sunflower oil, thistle oil, linseed oil, plant germ oil, etc.) and of various samples of margarine for the presence of volatile N-nitroso-compounds yielded the following results. By means of the following procedure (GLC, alkaliflame ionization detector GLC, thermal energy analyser), N-nitrosodimethylamine (NDMA) was found to be present in 21 of 61 different samples of vegetable oil, in concn. ranging from $<1 \mu\text{g/kg}$ to $23 \mu\text{g/kg}$. 18 samples contained N-nitrosodiethylamine (NDEA) in concn. varying between $<1 \mu\text{g/kg}$ and $27.8 \mu\text{g/kg}$. 37 out of 107 different samples of margarine were shown to contain N-nitroso compounds. NDMA was found to be present in 15 samples. The range of concn. determined was between $<1 \mu\text{g/kg}$ and $5.8 \mu\text{g/kg}$. 33 samples

contained NDMA in concn. varying between $<1 \mu\text{g/kg}$ and $7.5 \mu\text{g/kg}$. AS

11

The metabolism of fatty acids, methyl ketones and secondary alcohols by *Penicillium roqueforti* in Blue cheese slurries.

King, R. D.; Clegg, G. H.

Journal of the Science of Food and Agriculture 30 (3) 197–202 (1979) [20 ref. En] [Nat. Coll. of Food Tech. Univ. of Reading, St George's Avenue, Weybridge, Surrey, UK]

P. roqueforti caused considerable lipolysis during incubation at 25°C for 6 days in Blue cheese slurries at pH 5.2. Flavour intensity reached a max. on day 5 and then decreased, while the quantity of free fatty acids remained constant. Methyl ketones and secondary alcohols were not detected. Addition of hexanoic and octanoic acids to the slurries prior to incubation inhibited lipolysis and resulted in production of 2-pentanone and 2-heptanone; secondary alcohols were not produced in detectable quantities. Methyl ketones (2-pentanone, 2-heptanone and 2-nonanone) and secondary alcohols (2-pentanol, 2-heptanol and 2-nonanol) added to the slurries in quantities $10\times$ those found in mature Blue cheese, were metabolized by *P. roqueforti*, methyl ketones being produced from secondary alcohols with the same number of C atoms. Addition of butanoic, hexanoic and octanoic acids to the cheese slurries, in quantities greater than those found in mature Blue cheese, reduced but did not prevent the metabolism of 2-nonanone. Conditions prevailing in the Blue cheese slurry are different from those in Blue cheese, but it is hoped that the slurry will provide a model system for studying rapid development of Blue cheese flavour. MEG

12

[Determination of the ammonia content of caseins, caseinates and coprecipitates. III. Determination of NH_4^+ content of ammonium caseinates by Nessler's reagent.] Bestimmung des Ammoniakgehaltes von Caseinen, Caseinaten und Copräzipiaten.

III. Bestimmung des NH_4^+ -Gehaltes von Ammonium-Caseinaten mit Nessler's Reagenz.

Mrowetz, G.

Milchwissenschaft 34 (6) 360–361 (1979) [2 ref. De, en] [Inst. für Chemie & Physik, Bundesanstalt für Milchwissenschaft, Kiel, Federal Republic of Germany]

Ammonium caseinate samples (100 mg) were dissolved in 1 ml of a solution containing 60 g urea in 60 ml water acidified with 1 ml 10% HCl. After dilution with 20 ml water, the protein was precipitated by addition of 1 ml of 30% $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ solution. NH_4^+ present in the clear filtrate was determined by the reaction with Nessler's reagent and measurement of the resulting yellow-brown colour at 425 nm. For a caseinate with a NH_4^+ content of 1.01%, the standard deviation was $\pm 0.02\%$. Recoveries of 0.5–1.5 mg NH_4^+ added to 100 mg caseinate with low NH_4^+ content, were quantitative. The method is also suitable for measuring NH_4^+ in cheeses such as ripe Camembert. [See FSTA (1979) 11 9P1457 for part II] MEG

lar cheese flavour studies. II. Relative flavour contributions of individual volatile components. Lillard, D. J. *Journal of Dairy Research* 46 (3) 523-529 (1979) [f. En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, UK] Multiple regression analysis was used to relate contributions of individual flavour components to the flavour of Cheddar cheese. Equations were derived that relate Cheddar flavour to the headspace concn. of 2-pentanone, methanethiol and methanol. The concn. of 2-pentanone and H_2S found in cheese headspace were related to the flavour defects 'fruity' and 'sulphide' resp. *J. Food Sci.* (1979) 11 1P88 for part I.] AS

Chemical production of essential Cheddar flavour compounds. Lillard, D. J. *Journal of Dairy Research* 46 (3) 531-537 (1979) [f. En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, UK] Possible mechanisms for the production of volatile compounds during the ripening of Cheddar cheese were studied. Slurries of cheese made with and without starter organisms were treated with dithiothreitol (DTT) and the chemical composition of the headspace was determined. Cheeses were also pressed from curd treated with DTT and glutathione (GSH). Reactions occurring between methionine, cystine and sodium caseinate and ripening agents cysteine, DTT and GSH were also studied. In addition, the reactions of H_2S with methionine and sodium caseinate were investigated. Treatment of cheeses with DTT and GSH resulted in production of H_2S and methanethiol together with development of Cheddar flavour. Similar treatment of methionine and sodium caseinate also yielded H_2S and methanethiol whereas cystine produced only H_2S . H_2S reacted with both sodium caseinate and methionine to yield methanethiol. Results are consistent with the occurrence of some of the chemical reactions which occur during the ripening of Cheddar cheese. AS

Headspace analysis of hard cheeses. Lillard, D. J.; Moore, C. *Journal of Dairy Research* 46 (3) 539-545 (1979) [f. En] [Nat. Inst. for Res. in Dairying, Shinfield, Reading RG2 9AT, UK] A method is described for the chromatographic analysis of the headspace of hard cheese. Among the cheeses examined were 12 commercial cheeses (Emmentaler, Caerphilly, Stilton, Leicester, Double Gloucester, Cheshire, Gouda, Wensleydale and 5 varieties of Cheddar) and 12 Cheddars made in the RD experimental dairy. Those varieties containing low concn. of S compounds had little aroma and derived most of their flavour from taste and texture. The concn. of 2-pentanone was found to be a good indicator of maturity of Cheddar cheese. AS

16

Comparative analysis of fresh and stored commercially cultured buttermilk by gas chromatography.

Vasavada, P. C.; Lillard, D. A.

Journal of Chromatographic Science 17 (4) 215-218 (1979) [27 ref. En] [Dep. of Anim. and Dairy Sci., Univ. of Georgia, Athens, Georgia 30602, USA]

The volatile flavour compounds of commercially cultured buttermilk were collected using a Likens & Nickerson steam-distillation-extractor and analysed by gas chromatography in order to study the flavour changes occurring during a 2-wk storage of this product at $7 \pm 2^\circ C$. Separation of diacetyl, acetoin, 2,3-butenyl glycol, acetaldehyde and acetic acid was achieved by using a 100/150 mesh Porapak Q column in a gas chromatograph equipped with a flame ionization detector. The column was programmed to operate at $100-200^\circ C$ at the rate of $10^\circ C/min$ with a N_2 carrier gas flow of 45 ml/min. Tentative identification of resultant peaks was made by comparing the relative retention of the peaks on the chromatograms of ether extracts of the samples and known mixed standards. Gas chromatograms of ether extracts of fresh (0 day) samples showed more peaks and larger total peak areas than did the chromatograms of the same samples after 15 days storage at $7 \pm 2^\circ C$. AS

17

Mechanisms of formation of aroma compounds in milk and milk products. [Review]

Forss, D. A.

Journal of Dairy Research 46 (4) 691-706 (1979) [80 ref. En] [Invermay Agric. Res. Cent., Min. of Agric. & Fisheries, Mosgiel, New Zealand]

This paper, delivered at the 20th International Dairy Congress held in Paris in June 1978, deals with aroma or volatile chemicals so that bitter taste, of importance in cheese, is excluded. A mechanistic classification was adopted to give a broad outline of flavour formation in 4 sections: transfer of flavour components to milk (effects of feed, pollutants and toxic agents, e.g. cruciferous weeds, kale); enzymic reactions in cheese (formation of fatty acids, ketones and S compounds, and some resultant off-flavours); non-enzymic reactions in milk and milk products (oxidation, heating, radiation); and secondary reactions (formation of oxygenated, S and N compounds). It was suggested that, since ways of obtaining desirable flavours are not always known or predictable and with cheese are very expensive, the solution in many cases may be to generate flavours separately in simple systems or from semi-synthetic chemicals, or by modifying processing conditions to accelerate their formation. DMK

18

A method for the objective assessment of cheese flavour.

Robinson, R. K.

Milk Industry 81 (6) 34-35, 37 (1979) [8 ref. En] [Dep. of Food Sci., Univ. of Reading, Reading Berks, UK]

In the proposed scheme, cheeses are graded by a panel of 10 tasters, each of 15 characteristics (5 each associated with 'milk', 'mature' and 'off' flavours) being

scored between 0 (lacking) and 5 (strong). When 2 panels each evaluated one 'mild' and one 'mature' Cheddar cheese obtained from a local supplier, overall scores they assigned to the cheeses were broadly similar. Results indicate the possibility of operating a grading scheme based on assessments by a panel of untrained personnel where no professional grader is available. CDP

19

The quantitative determination of trimethylamine in egg.

Hobson-Frohcock, A.

Journal of Food Technology 14(4) 441-447 (1979) [25 ref. En] [ARC Food Res. Inst., Colney Lane, Norwich NR4 7UA, UK]

Trimethylamine (TMA), responsible for 'fishy' taint in eggs, is quantitatively determined by a freeze-drying/GLC procedure. 1-g samples of blended yolk and white are placed in a tube having a side-arm and a ground glass opening. A 'cold finger', having a ground glass stem taper is inserted into the tube to seal the top. The sample is frozen by immersion of the tube into liquid N_2 , with addition of liquid N_2 to the cold finger. Freeze-drying is accomplished by evacuating the tube through the side-arm, and maintaining it at 0.05 Torr for 2.5 h. Condensate remaining is evaporated to dryness and dissolved in 250 μ l of 0.1N HCl for GLC analysis. A glass column packed with Chromosorb 103 50-60 mesh coated with 20% KOH is used. The initial 4 cm of the column was packed with 40-80 mesh soda lime to release TMA from its salt. TMA could be routinely detected at concn. $\geq 0.05 \mu$ g/g egg. The method is suitable for all foods having a moisture content high enough for freeze-drying; dried foods would require prior addition of water. DIH

20

Changes in free nucleotides, nucleosides and bases during preparation of pre-cooked dehydrated minced meats.

Arya, S. S.; Parihar, D. B.; Vijayaraghavan, P. K. *Nahrung* 23(5) 497-501 (1979) [9 ref. En, de, ru] [Defence Food Res. Lab., Mysore-10, India]

Changes in concn. of nucleotides, nucleosides and bases (inosinic, cytidylic, uridylic and guanylic acids, inosine, hypoxanthine, adenine, uracil and guanine) during manufacture of dried cooked/cured or cooked non-cured minced goat meat or mutton products were studied. Tables of data are given showing concn. of the above constituents in raw meat samples, and in samples after curing (where appropriate), cooking, air-drying (at 65°C) or freeze-drying, and also for the concn. of inosinic acid, adenylic acid, inosine and hypoxanthine in commercially-prepared and laboratory-prepared freeze-dried mutton chunks. The results for non-cured minced meat show significant losses of nucleotides (except adenylic acid) and corresponding increases in nucleoside and base concn. during cooking; little change occurred as a result of drying. Residual concn. of inosinic acid, which has a flavour-potentiating action, were relatively little lower than concn. in freshly cooked meat, suggesting that the poor flavour of dried cooked meat is not due to inosinic acid loss. Inosinic

acid concn. decreased as a result of curing; losses of other nucleotides were not significant. Changes during cooking and drying were approx. the same as for uncured meat. Addition of EDTA at a concn. of 500 p.p.m. significantly reduced hydrolysis of inosinic acid during cooking and curing; 200 p.p.m. EDTA had relatively little effect. The commercial cooked dried meat chunks had very low inosinic acid and adenylic acid concn., and contained no detectable cytidylic, uridylic or guanylic acid; these low nucleotide levels are attributed to leaching during cooking. Laboratory-prepared samples showed fairly high inosinic acid losses. The very low inosinic acid concn. in the commercial product may be responsible for its poor flavour. AJDW

21

[Composition of polyphenols in the leaves of horseradish, celery, parsley and dill.]

Skorikova, Yu. G.; Gavrilishina, L. I.

Konservnaya i Ovoshchesushil'naya Promyshlennost' No. 2, 31-34 (1979) [1 ref. Ru] [Krasnodarskii Nauchno-issled. Inst. Pishchevoi Promyshlennosti, Krasnodar, USSR]

The named leaves are used as aroma-formers in canning; leaves cultivated in the Crimean and Krasnodar regions were studied for polyphenols. Polyphenols were identified by paper chromatography of leaf extracts. Extraction methodology is briefly described along with hydrolysis of extracts with acids and alkalis, and also detection techniques. The leaves contained various polyphenolic compounds, but these glycosides are, as a rule, derivatives of the respective aglycones. All the flavonic glycosides present do not contain free OH groups on the C_3 atom. According to R_f and qualitative reactions, these belong to apigenin and luteolin derivatives. Various vegetables contained heteroglycosides of akacetin, quercetin and hydroxycinnamic acids. A detailed composition of polyphenols is given for parsley and celery. The named polyphenols are found to be very stable, persisting in canned products. STI

22

Oilseed residues. Determination of moisture and volatile matter content.

International Organization for Standardization *International Standard ISO 771-1977*, 2pp. (1977) [En]

A method is specified for detn. of the moisture and volatile matter content of residues (excluding compounded products) obtained by the extraction of oil from oilseeds by pressure or solvent. It involves drying a test portion at $103 \pm 2^\circ\text{C}$ in an oven at atm pressure until practically constant mass is reached. AL

23

The H&R fragrance circle.

Harder, U.

H&R [Haarmann & Reimer] Contact No. 23, 18-23 (undated) [4 ref. En]

With the Haarmann and Reimer fragrance circle an attempt was made to arrange important categories of

in a 2-dimensional system. The fragrance circle, is illustrated, is explained with respect to the place in importance, in perfumery, of the various categories; important odour relationships; the position of the perceived fragrance of perfume compositions; and correlation of chemical structures with odour categories. Possible applications of using the fragrance circle are discussed. An explanation of terms used outside the fragrance circle is given. SP

Changes in contents of volatile compounds in beers with barley adjunct.]

Ček, J.; Cepicka, J.; Perina, V.

Průmysl 25 (3) 49-52 (1979) [Cs, ru, en, de]

Chem. a Tech. VŠCHT, Prague, Czechoslovakia]

The effect of a barley adjunct, free of enzymic preparations, on the content and quality of volatile compounds in 10° light beer from a double decoction was investigated. As the barley adjunct increased from 10 to 40%, volatile compounds and their components (detected by gas chromatography) selected from the groups of higher aliphatic alcohols and β -phenyl alcohols, lower fatty acids and β -phenylacetic acid and esters, increased in the finished beers. STI

Reproducibility of headspace analysis of wines.

Lee, A. C.; Murakami, A. A.; Coope, G. F., III

Journal of Agricultural and Food Chemistry 27 (2)

1452 (1979) [12 ref. En] [Dep. of Viticulture &

Enology, Univ. of California, Davis, California 95616,

USA]

Wine headspace volatiles, collected by displacement into a Tenax GC adsorbent trap by a modification of the procedure described by Noble [Analysis of foods and beverages, headspace techniques. Academic Press, New York (1978) pp. 203-228], were analysed quantitatively by gas chromatography (GC). Triplicate analyses were made using 2 displacement end points, and the reproducibility of the 2 procedures was evaluated by calculation of the coeff. of variation (CV) for the peak areas. Of the 48 peaks quantified, 60% had a CV < 0.30, with 21-25% having CV < 0.10. Small peaks consistently showed the poorest reproducibility. CV for larger peaks, ranging from 0.010 to 0.077, were similar to those reported by Stenroos et al. [see FSTA 1979 11 10H1600] in the GC analysis of beer volatile compounds. Variation in the displacement end point did not significantly affect the reproducibility of the procedure; however, both sets of data represented a significant improvement in reproducibility over the results reported previously by Noble. AS

Retention of volatiles during freeze drying of tomato

pe.

Schenson, L. N.; Bartholomai, G. B.; Chirife, J.

Journal of Food Technology 14 (4) 351-360 (1979)

[12 ref. En] [Dep. de Ind., Univ. de Buenos Aires, Ciudad

Buenos Aires, Argentina]

¹⁴C-labelled butyl acetate was used as a model volatile. The variables studied were initial solids content, freezing rate, initial volatile concn. and sample thickness. The observed effects of initial solids content and freezing rate on volatile retention conformed to expectations. Thickness of samples was also a factor in volatile retention, but the results here obtained did not appear to be easily explained by current retention theories. The retention was found to be approx. constant for most of the range of initial volatile concn. studied. Adsorption-desorption experiments demonstrated that adsorption does not constitute a mechanism of butyl acetate retention in freeze dried tomato juice. AS

27

[Volatile nitrogenous substances and their content in spirits and vodka.]

Sukhodol, V. F.; Pavchelyuk, I. D.; Kuts, A. M.; Bachurin, P. Ya.

Fermentnaya i Spirtovaya Promyshlennost' No. 3, 29-32 (1979) [9 ref. Ru] [KTIPP, USSR]

The content of volatile N substances in various rectified and raw ethanols was determined. The correlation between the content of specific substances and testing examination of ethanol and vodka was recorded. Gas chromatography was used to determine trimethylamine, triethylamine, diethylamine, propylamine and butylamine. The effects of individual amines and ammonia on sensory properties of spirit and vodka were studied. The effects of individual components decreased in the following order: triamines, diamines, monoamines, ammonia. If the sensory evaluation is low, the volatile N compounds content should be determined using the Nessler method. STI

28

[Monitoring keeping quality status of roast coffee by volatile sulphur compounds.]

Noomen, P. J.

Chemie Mikrobiologie Technologie der Lebensmittel 6 (2) 48-51 (1979) [9 ref. En, de] [DE] Int. Res. Co. BV, Utrecht, Netherlands]

A combination of a concentrating headspace technique, a packed column gas chromatographic system with a pre-column injection facility and a specific flame photometric detector for sulphur-containing compounds is used for monitoring the ageing of roast coffee. A correlation is presented between the ratio of 2 peak areas in the chromatograms and the organoleptic assessment of coffee samples of different ageing status. An individual correlation appears to exist for each type of coffee. The method of analysis allows monitoring of the influence of e.g. packing material and temp. on the ageing process of roast coffee. It is intended as a support to expert quality assessments. AS

29

[Behaviour of some minor volatile aroma components during coffee staling.]

Verhalten einiger schwererflüchtiger Aromastoffe während der Alterung von Röstkaffee.

Tresel, R.; Grunewald, K. G.; Kamperschröer, H.; Swan, R.
Chemie Mikrobiologie Technologie der Lebensmittel
 6(2) 52-57 (1979) [11 ref. De, en] [Lehrstuhl für
 Chemisch-Tech. Analyse, Univ., Berlin]

Freshly roasted coffee beans were stored at 25°C in packages with access of air. By means of a special separation process involving enrichment by distillation-extraction, adsorption chromatography, capillary gas chromatography (GC), capillary-GC-MS minor volatile aroma components have been identified and quantified during coffee staling. We investigated the behaviour of 3 furfurylpyrroles, which possess typical aroma notes, and other N-substituted pyrroles, formed by Maillard reaction from hydroxyproline. We also investigated several phenols, especially 4-vinylguaiacol, as well as C-substituted pyrroles. Of the S-containing trace compounds, furfurylmethylsulphide, to which the "coffee-like" aroma is attributed, remained constant. On the other hand, furfurylmercaptan and the analogous 5-methylfurfurylmercaptan, identified for the first time in coffee, increased greatly after only a few days. Furfurylmercaptan possessed the pleasant aroma of freshly brewed coffee in amounts of 0.01-1 parts/billion (p.p.b.) in water but was mercaptan-like and sulphurous in amounts of 5-10 p.p.b. AS

30

[Tests on aroma regeneration in strawberry compotes using crude enzyme extracts.]

Horubala, A.; Klepacka, M.; Karłowicz, H.
Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego Akademii Rolniczej w Warszawie, Technologia Rolno-Spozywcza No. 12, 165-173 (1978) [12 ref. Pl, ru, en] [Inst. Tech. Zywnosci, SGGW-AR, Warsaw, Poland]

Strawberry compotes made by the Lowicz (Poland) factory of fruit and vegetable products and stored for 9 months at room temp. in 0.9-kg cans were used for the tests. Volatile aroma substances were removed from the compotes using a vacuum evaporator for 5 h at 20°C and < 100 mm Hg. 100-g portions of homogenized strawberries from the compotes taken (i) before and (ii) after vacuum treatment, (iii) after treatment of (ii) with a crude enzyme preparation from frozen strawberries made by the procedure of Heatherbell & Wrolstad [FSTA (1971) 3 8] 1047 and (iv) after similar treatment of (ii) with a corresponding enzyme preparation from white mustard seeds were extracted twice with peroxide-free diethyl ether, the solvent was removed at 37°C and the residues were examined by GLC. The proportions of different peaks and of low-boiling and high-boiling aroma compounds in (i)-(iv) are discussed with reference to the activities of the 2 enzyme preparations used, and it is concluded that the mustard enzyme was more active than the strawberry enzyme in tending to restore the initial levels of volatile compounds. SKK

31

Use of canonical variate analysis in the differentiation of swede cultivars by gas-liquid chromatography of volatile hydrolysis products.
 Cole, R. A.; Phelps, K.

Journal of the Science of Food and Agriculture 2, 669-676 (1979) [12 ref. En] [Nat. Vegetable Res. Sta., Wellesbourne, Warwick, UK]

Swede cv. can be differentiated by their volatile hydrolysis products obtained after maceration. Multivariate statistical techniques however, are required to interpret the data because of the interactions between volatiles. Canonical variate analysis allowed a chemical interpretation to be placed on the effects of storage and provided a basis for differentiating between cv. The relative chemical configuration of the cv. is displayed graphically by plotting the cv. means relative to the first 2 canonical variates. AS

32

Some observations on the flavor of acid whey.

McGugan, W. A.; Larmond, E.; Emmons, D. B.
Canadian Institute of Food Science and Technology Journal 12 (1) 32-35 (1979) [16 ref. En, fr] [Food Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario K1A 0C6, Canada]

A flavour profile of 8 flavour characteristics was established for samples of acid whey. When increasing concn. of whey were added to skim milk, brothiness was first noted when 20% whey had been added, and diacetyl, bitterness and sweetness were noted when 40% whey was added; volatile acidity, non-volatile acidity, astringency and saltiness were detected only in 100% whey. Neutralization of whey produced changes in all 8 flavour characteristics. Most of the whey flavour components were dialysable, and vacuum-treated material from dialysed whey was not significantly different from whey. Exclusion of the non-dialysable components did not improve acceptability of whey. Whey volatiles added to skim milk influenced diacetyl flavour and, to a lesser extent, volatile acidity and brothiness. DMK

33

Retention of sparingly soluble volatile compounds during the freeze drying of model solutions.

Smyrl, T. G.; LeMaguer, M.
Journal of Food Process Engineering 2(2) 151-170 (1978) [35 ref. En] [Dep. of Food Sci., Univ. of Alberta, Edmonton, Alberta, Canada T6G 2N2]

The retentions of terpenic essential oil components (carvone, pulegone and piperitone) and non-terpenic essential oil components (eugenol and m-anisaldehyde) were measured during the freeze-drying of model aqueous solutions. Model solutions contained sucrose, glucose, sodium chloride or gum arabic which are all common food components. The % retentions of these slightly soluble flavouring compounds were found to increase with increased initial solids concn., decreased initial volatile content, increased sample thickness, increased freezing rate and the absence of an additional sparingly soluble volatile. AS

34

Evaluation and discrimination of soy sauce by computer analysis of volatile profiles.
 Aishima, T.

Natural and Biological Chemistry 43 (8) 1711-1719 [17 ref. En] [Noda Inst. for Sci. Res., Noda-shi, Chiba-ken, Japan]

Relationships between GLC profiles and sensory attributes of 72 purely fermented soy sauce samples were studied by multiple regression analysis and principal component analysis (PCA). Prior to the analysis, GLC chromatograms were transformed into 7 different modes in order to facilitate the fitting to a hypothetical linear model. The results from logarithmically transformed ratio each peak area to the sum of whole peaks showed the best precision of reproducibility for sensory score ($R = 0.978$). As the results of PCA, eigen values of 10 principal components were shown to be larger than 1.0 but the 5 major components could account for 66% of the variance in the total variance of 39 GLC peaks. The 1st and 2nd PC showed the importance for aroma quality and similarity or dissimilarity in profiles of extracted PC showed a clear trend with quality differences evaluated by sensory tests. These results showed the importance of the harmonious balance of each aroma compound for the development of a preferable soy sauce aroma. AS

and the taste of foods.

Reau, J. C.

Abstracts of Papers, American Chemical Society 177 AGFD 63 (1979) [En] [Sensory Sci. Cent., Univ. of Houston, Houston, Texas 77030, USA]

One of the better known taste sensations are salty, sweet (at least 2 types), bitter (at least 2 types), pungent, pungent, metallic and 'umami' [taste of sodium glutamate of 5'-ribonucleotides] (2 types). The psychophysical taste of a food consists of a complex of these and other sensations. Compounds known to activate taste systems include most of the non-substances found in foods: amino acids, nucleotides, inorganic ions, organic acids, sugar, alcohols, alkaloids, phenols, etc. Of especial importance are S and N compounds, heterocyclic compounds (5 and 6 member rings), lactones, and various phenolic (often polycyclic) compounds. Many of these food compounds considered to function primarily as taste are strongly taste active. These and other taste active compounds in foods define the chemical signals of importance in human nutritional ecosystems. Recent changes in agricultural practice have produced variations in these chemical signals. AS

Sweet and bitter compounds: structure and taste relationships.

Matz, H.-D.; Chen, W.; Jugel, H.; Treleano, R.; Moser, H.

Abstracts of Papers, American Chemical Society 177 AGFD 75 (1979) [En] [Inst. für Lebensmittelchem., Ludwig-Maximilians-Universität München, Munich, Federal Republic of Germany]

The hypothesis that a bipolar (dipoleophilic/electrophilic) structure of a hydrophobic group is required for sweet taste, and a monopolar (electrophilic) hydrophobic structure is sufficient for bitterness; and that steric considerations determine the actual taste of bipolar hydrophobic compounds, was

investigated. Aldehydes and ketones (electrophilic carbonyl C) with sufficiently long side chains are bitter. Recognition threshold concn. (C_t) of lactones are higher, and of lactams are lower, than those of cycloalkanones of the same ring size. C_t varies with ring size. C_t values of a number of esters, amides, alkyl-ureas, substituted piperidines, aromatic compounds and some simple substituted alkanes and hydroxycarboxylic acids were measured and throw further light on the relationship between taste and structure. Quality and intensity of taste depend on nature and position of functional groups and hydrophobicity of the molecule. Within a series of homologous compounds, and for a limited length of C chain, the relationship between $\log C_t$ and length of C side chain is linear. DIH

37

[A simple method for determining the carbonyl value of volatile carbonyl compounds. II. Identification and recovery tests of volatile carbonyl compounds separated by the benzene distillation method.]

Ohyabu, D.; Iizuka, T.; Kusaka, H.; Ohta, S.

Journal of Japan Oil Chemists' Society [Yukagaku] 28 (4) 263-269 (1979) [12 ref. Ja, en] [Ajinomoto Co. Inc., Tokyo, Japan]

Volatile carbonyl compounds separated from rancid rice crackers (fried in soybean oil or lard) by the benzene distillation method were converted to their 2,4-DNPH derivatives and identified by TLC. C2-C6 aldehydes were found, with C6 aldehyde the major component. Recoveries of volatile carbonyl compounds were improved by using solvents with a b.p. higher than that of benzene; with heptane as solvent, recovery of hexanal was increased from 64 to 88%. [See preceding abstr. for part I.] [From En summ.] RM

38

[Symposium. Aroma substances and foods: A dialogue between consumer and producer. Friday October 6th, 1977.] Colloque. Aromes et aliments: Données d'un dialogue consommateurs et industries. Jeudi 6 Octobre, 1977. [Conference proceedings.] France, Association pour la Promotion Industrie Agriculture (APRIA) 149pp. (undated [1978?]) [Fr] 35 Rue du General Foy, 75008 Paris, France; APRIA (London, UK; Food Trade Press Ltd. Price £23.00)

Papers given at this symposium were divided into 3 sessions: I. The consumer's viewpoint, which included: Views, fears, criticisms, by -. Custot (pp. 7-17). Individual physiology - use of the organs of sense, hedonic value of foods, and their impact on the individual's psychology, by -. Cabanac (pp. 19-31). Information given to the press, by I. Andrieu (pp. 33-39). II. The consumer and his protection, which included: What is Nature doing? Aroma substances present in foods: chemical composition and qualitative significance, by H. Richard (pp. 43-50, 7 ref.). What Science is doing, by -. Derache (pp. 51-57). The public's rights: elements of a law, guarantee and means of application and administration of the law, by J. Thevenot (pp. 59-61). III. Role of aroma substances and the interest they arouse which included: Aroma

compounds in foods, by J. N. Janbert (pp. 89-104). Utilization of aroma compounds by the food industry, by - Menoret (pp. 105-117). The consumer's understanding of food. Consumer education, Misconceptions and truth, by - Francois (pp. 119-130). Discussions of the sessions are summarized on pp. 65-83 and 131-138, and the Conclusions are given on pp. 139-149. HBr

39

[Studies on odour substances of fungi.
I. Identification of the fungal odours produced on a synthetic medium.]

Saito, M.; Yamanishi, T.; Tsuruta, O.

Report of the National Food Research Institute [Shokuryo Kenkyusho Kenkyu Hokoku] No. 34, 67-69 (1979) [8 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric., Forestry & Fisheries, Tokyo, Japan]

Volatiles from the conc. distillates of *Aspergillus terreus*, *Penicillium pusillum*, *Pyclopium*, *Trichoderma* sp., *Glilocladium* sp. and *Paecilomyces lilacinus* grown on Czapek agar medium were analysed by gas chromatography-MS. Ethyl acetate, ethanol, iso-butanol, *n*-butanol, iso-amyl alcohol, 3-octanone, 1-octen-3-ol, and octanol were identified from all spp. tested. Notably, 1-octen-3-ol and 3-octanone with a strong fungal odour and a citrus-like odour, resp., were considered to be characteristic of the odours of the fungi. [From En summ.] JRR

40

[Determination of volatile acidity in wines.
Suggestion of a simplified technique by oxidizing the sulphurous acid before steam distillation.] Beitrag zur Bestimmung der flüchtigen Acidität von Weinen. Vorschlag eines durch Oxydation der Schwefligen Saure vor der Wasserdampfdestillation vereinfachten Verfahrens.

Schneyder, J.; Pluhar, G.

Mitteilungen Klosterneuburg, Rebe und Wein, Obstbau und Früchteverwertung 27 (1) 14-17 (1977) [9 ref. De, en, fr] [Land.-chem. Bundesversuchsanstalt, A-1020 Vienna, Trunnerstrasse 1, Austria]

By weak alkalification and oxidation of the free and of the released fixed sulphurous acid in an acid milieu with FeCl₃ before steam distillation, the detn. of the volatile acidity of wines may be simplified. Owing to the limited significance of 'free' volatile acids in the development of the 'vinegary taste' as compared to that of the ester component it is suggested, in concurrence with the analytical reality, to indicate the volatile acidity value only to m-equiv. units, or as acetic acid calculated to dg units/l. Difficulties in connection with the iodometric detn. of sulphurous acid when determining the volatile acidity in the steam distillate are pointed out. AS

41

Genesis of volatile constituents of tea.

Bajaj, K. L.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 61 (3) 124-129 (1979) [77 ref. En, de, es, fr, it] [Punjab Agric. Univ., Ludhiana, India]

The author reviews the flavour constituents in tea leaves, proposed biosynthetic pathways of flavonoid formation, effects of climate and weather during cultivation, effects of handling and storage, changes in volatile constituents during withering, rolling, fermentation and firing (formation of black tea), some recently reported flavour constituents and their specific characteristics. RM

42

Beer flavor terminology.

Meilgaard, M. C.; Dalglish, C. E.; Clapperton, J. F.

Brygmesteren 35 (10) 249-260 (1979) [9 ref. En] [Sno-Brewery Co., Detroit, Michigan 48226, USA]

See FSTA (1979) 11 9H1359.

43

Taste components of potatoes.

Solms, J.

Abstracts of Papers, American Chemical Society 177 (1) AGFD 67 (1979) [En] [Dep. of Food Sci., Swiss Federal Inst. of Tech., 8092 Zurich, Switzerland]

Although boiled potatoes are rather neutral in taste, odour and textural attributes, their overall acceptance in European diets is very high. A special impact of flavour and texture is achieved by frying or roasting, however, without changing the basic potato notes. The significance of free sugars and sugar derivatives, of organic acids, amino acids and amino acid derivatives, of polyphenols, vitamins, minerals, alkaloids and starch is discussed. Compounds of these classes act either directly or as precursors of potato flavour. Chemical analysis combined with sensory evaluation has shown that 5'-nucleotides and amino acids form a synergistic mixture responsible for a basic agreeable taste note. The amino acids, already present in the raw material, are slightly changed in composition during preparation. The 5'-nucleotides, mainly 5'-GMP and 5'-AMP, are liberated specifically from the RNA present during heating. Potato tubers contain a complex system of RNA-attacking enzymes comprising phosphodiesterase I and II, RNase, phosphatases and 5'-nucleotidase. Optimum release of 5'-nucleotides occurs at 52°C and pH 6.0. These conditions correspond to those during boiling potato tubers. The relationships between total enzymic activities and formation of 5'-nucleotides are discussed in detail, and the significance of the reaction products for overall flavour is outlined. AS

44

The importance and origin of earthy odor components in beets.

Tyler, L. D.

Dissertation Abstracts International, B 39 (11) 5300 Order no. 79-10838, 82pp. (1979) [En] [Cornell Univ., Ithaca, New York 14850, USA]

Attempts were made to isolate (i) geosmin and (ii) 2-methylisoborneol from beets; these 2 volatile compounds have an earthy odour. Analysis of natural beet essence failed to indicate the presence of (i) and 3 of its stereoisomers. A method was developed for quantifying (i) in beet juice: it involves extraction of (i) with Freon 113, followed by concn., purification by adsorption on Florisil and quantification by gas

matography. The method was used to determine amount of (i) in beets grown on sterile sand and in Queen beets during growth and storage. Results stated that (i) is present throughout beets with the least concn. occurring in the peel. The metabolic n of (i) could not be pinpointed but soil was inated as a passive source. Studies with beet juice tested that (i) contributes to the characteristic na of beets up to a concn. of approx. 5.8 µg/l. This l approaches the concn. of (i) found in raw juice but uch greater than the concn. found in commercially ed beets, indicating that the level of (i) is reduced ng processing. JA

Study of the chemical and flavor profiles of Swiss cheese.

de, S. L.

Sertation Abstracts International, B 38 (7) 3110: Ser no. 77-29826, 111pp. (1978) [En] [Iowa State v., Ames, Iowa 50010, USA]

Flavour of Swiss cheese could be adequately defined by flavour notes. Some relationships between flavour and chemical analyses were suggested but, in general, it was not possible to predict flavour of cheese from chemical analysis or from flavour observations on soluble, water-soluble volatile or water-soluble non-volatile flavour-bearing fractions; this was probably due to complex interactions among flavour constituents. Occurrence of long-chain fatty acids in the non-fat phase of cheese may have resulted from binding by the case protein. The extent of binding of the $\geq C4$ fatty acids decreased with proteolysis. DMK

The taste of fish and shellfish.

onosu, S.

Abstracts of Papers, American Chemical Society 177 AGFD 68 (1979) [En] [Lab. of Marine Biochem., Fac. Agric. Univ. of Tokyo, Bunkyo-ku, Tokyo 113, Japan] Traditional Japanese consumption of a wide variety of marine products, such as algae, molluscs, crustaceans, fish, etc. has stimulated studies on taste active compounds in the extractives of sea foods. Free amino acids (glycine, alanine, proline, glutamic acid, methionine and histidine), dipeptides (anserine and alanine), nucleotides and related compound (IMP, AMP and hypoxanthine), quaternary ammonium bases (glycine betaine and trimethylamine oxide), organic acids (succinic acid) have so far been reported to be responsible for tastes of sea foods. The majority of researchers, however, neglected to confirm by organoleptic tests whether these substances really contribute to the tastes of these foods. We have recently analysed free and combined amino acids, nucleotides, quaternary ammonium bases, organic acids, sugars and minerals in extract of leg meat of boiled snow crab, one of the most delicious sea foods, and examined the contribution of each constituent to the characteristic taste through sensory tests of artificial extracts prepared by simulating the natural extract. The results showed that 8 N components, glycine, alanine, glutamic acid, arginine, AMP, GMP, CMP and glycine betaine,

and 4 kinds of inorganic ions, Na^+ , K^+ , Cl^- and PO_4^{3-} , were essential for the characteristic taste of crab meat. 3 major components of the extract, proline, taurine and trimethylamine oxide, as well as other minor components made little contribution. AS

47

Comparison of isolation procedures for essential oils.

I. Dill (*Anethum graveolens* L.).

Koedam, A.; Scheffer, J. J. C.; Baerheim Svendsen, A. *Chemie Mikrobiologie Technologie der Lebensmittel* 6 (1) 1-7 (1979) [66 ref. En] [Dep. of Pharmacognosy, State Univ. of Leiden, Netherlands]

Volatile oils obtained from dill seed by distillation and by solvent extraction were compared. Dill seed in deionized water was distilled for 16 h, with hourly sampling of the oils obtained. Seed was also distilled for 4 h in buffer solutions ranging from pH 2.2 to 8.0, and dill seed and extracts were also heated under reflux for 4 h before distillation. Solvent extraction was performed with 50:50 pentane:diethyl ether; it is essential to grind the seed before extraction. Oils obtained were analysed by gas chromatography; results are shown in graphs and chromatograms. Carvone was the major constituent of early distillates, but the proportions of limonene increased with length of distillation, and the ratio limonene:carvone became 42:58 after 12 h. The oils were distilled in the sequence of their solubilities in water, not their b.p. (carvone 230°, limonene 176°C). The ratio of *cis:trans* dihydrocarvone varied with pH of the water in which the seed was distilled and differed from the ratio in solvent extracts. Owing to differences in flavour between carvone and limonene and between *cis* and *trans* isomers of dihydrocarvone, it is considered that solvent extracted oil is a more uniform product for food flavouring. Storage of seed produced no changes in the content or composition of the oil. ELC

48

Monographs on fragrance raw materials.

Opdyke, D. L. J.

Food and Cosmetics Toxicology 17 (4) 357-390 (1979) [many ref. En] [Res. Inst. for Fragrance Materials, Inc., P.P. Box 1152, Englewood Cliffs, New Jersey 07632, USA]

Information is presented on synonyms, structure, description and physical properties, occurrence, preparation, uses, analytical data, status, and biological data for the following fragrance raw materials: AETT (acetyltetramethyltetralin) (pp. 357-360, 14 ref.); dimethyl carbonate (pp. 361-362, 14 ref.); dimethyl malonate (p. 363, 8 ref.); dimethyl sulphide (pp. 365-368, 50 ref.); fir balsam oregon (pp. 369-370, 18 ref.); guaiene (p. 371, 6 ref.); *cis*-3-hexenyl salicylate (p. 373, 8 ref.); methyl heptene carbonate (pp. 375-376, 15 ref.); phenylacetaldehyde (pp. 377-380, 40 ref.); pimenta berry oil (p. 381, 11 ref.); stearic acid (pp. 383-388, 64 ref.); and triethyl citrate (pp. 389-390, 18 ref.). [See FSTA (1979) 11 12T639.] VJG

49

Volatile components and pungency in fresh and processed jalapeno peppers (*Capsicum annum*). Huffman, V. L.

Dissertation Abstracts International, B 38 (11) 5260: Order no. 78-06804, 63pp. (1978) [En] [Texas A&M Univ., College Station, Texas 77843, USA]

The flavour of fresh jalapeno peppers (cv. J100) was defined and quantified by GLC-MS. The characteristic jalapeno flavour was attributed to 2-isobutyl-3-methoxypyrazine which is unevenly distributed in the fruit; concn. range from 0 ng/g in the seed to 88.33 ng/g in the outer wall (dry wt. basis). The flavour is altered by thermal processing. Capsaicin, the compound responsible for the hotness of the flavour, is also unevenly distributed, concn. ranging from 0.45 mg/100 g in the seed to 18.37 mg/100 g in the cross wall of the fresh fruit. All portions of the pepper were found to have a hot taste after thermal processing. Microscopic examination of pepper tissue revealed no specialized structure housing the characteristic flavour and heat components; they are considered to be normal metabolites of the fruit occurring as an integral part of the plant cells. JA

50

Egyptain marjoram oil.

Karawya, M. S.; Hifnawy, M. S.

Egyptian Journal of Pharmaceutical Sciences 17 (4) 329-334 (1976, publ. 1979) [11 ref. En, ar] [Pharmacognosy Dep., Fac. of Pharmacy, Cairo Univ., Egypt]

The composition of marjoram volatile oil was determined using GLC, gas chromatography-MS, and IR spectrophotometry. 16 compounds were identified and are tabulated. It was concluded that marjoram volatile oil was free of any phenolic compounds, viz. thymol and carvacrol, and very rich in alcohols, especially terpinen-4-ol (40%) as well as α - and γ -terpinene, sabinene and terpinolene hydrocarbons. SP

51

Application of anatomical and psychophysical methods to studies of odour interactions. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture]

Laing, D. G.; Panhuber, H. pp. 27-46 (1979) [45 ref. En] [CSIRO, Div. of Food Res., North Ryde, Australia]

Present knowledge on odour interactions and methods employed to gain this information are reviewed. 2 new anatomical techniques which may provide data relevant to the processing of information from odour mixtures by the olfactory system are described. One approach, first described by Doving & Pinching [*Brain Research* (1973) 52, 115] is based on the morphological changes (shrinkage) of specific mitral cells of the olfactory bulb in rats exposed to a single odorant ranging from 2 wk to 11 month periods. The 2nd new method involves the use of [14 C]-2-deoxy-D-glucose ([14 C]-2-DG) to identify cells within the olfactory system which respond to specific odorants. SP

52

Some factors influencing the perception of flavour contributing substances in food. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture]

Land, D. G. pp. 53-66 (1979) [42 ref. En] [Food Res. Inst., Harpenden, UK]

The following factors are discussed: factors influencing volatility; deviations from Henry's and Raoult's Laws in simple systems; the effect of non-volatile solutes; biphasic systems; effect of phase state, solid phases; complex systems; and variations in perception. SP

53

Applications of gas and thin-layer chromatography in flavour analysis. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture]

Humphrey, A. M.

pp. 99-118 (1979) [6 ref. En] [Bush Boake Allen Ltd, Blackhorse Lane, London E17, UK]

The uses of N-specific detectors and combination of gas chromatography with TLC in flavour analysis are discussed and examples of adaptation of the 2 techniques, by the flavour chemist to the sort of problems he encounters, are given. N-specific detector has a significant increase in sensitivity over the Flame Ionisation Detector; it is very suitable for detn. of methyl anthranilate and methyl N-methylantranilate in citrus products, for the detn. of flavour compounds in aqueous samples (examples of detn. of 4-methylimidazole in caramel and caffeine in beverages and chocolate are given) and for detection and detn. of contaminants in other products. Variations of the TLC technique are described, these include pretreating plates with acid or impregnating them with buffers; applications of this technique include the separation of humulones in beer. SP

54

Deactivation of a metal transfer line between a gas chromatographic column and a flame photometric detector. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture]

Gramshaw, J. W.; Hussain, A.

pp. 129-134 (1979) [15 ref. En] [Procter Dep. of Food & Leather Sci., Univ. of Leeds, Leeds, UK]

The line and effluent splitter were removed from the chromatograph and connected to a reservoir. A solution of benzotriazole (1% in acetone) was allowed to flow under gravity so that the last part remained in the line. After 1 h the liquid was replaced with fresh solution and left for 1 h; this was repeated 3 times, and the line rinsed with acetone and water. The splitter was similarly treated. Before reconnection in the chromatograph the line and splitter were conditioned in a slow stream of N_2 for 5 h at 150°C. Results are presented in graphs and are discussed and show that coating with benzotriazole was found to be a simple and highly effective method of deactivating a stainless-steel transfer line. This helps prevent loss of triols during gas chromatography, which is important at the ng level in flavour research. SP

nised coupling techniques for gas chromatography-mass spectrometry in flavour research. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194].) [Lecture]
 Engan, S.; Höhn, M.; Dielmann, G.
 51-158 (1979) [2 ref. En] [Varian MAT GmbH, München, Federal Republic of Germany]
 The performance of a well-optimised gas chromatography-MS instrument for analysis of complex mixtures, e.g. flavours and odours, depends on the capillary column, the interface and the MS. The connecting element between capillary column and MS is critical; open coupling is the best choice for this type of measurement, the change of column is simple, fast and free of problems and the total ion chromatogram fully reproduces the flame ionisation detector record. This system is discussed in detail with the aid of diagrams. This interface ensures that the separation efficiency of HPLC capillary columns and chemical ionisation efficiency are maintained thus permitting unambiguous analysis. SP

Volatile components from thermally degraded thiamine. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194].) [Lecture]
 de, L. M. van der; Dort, J. M. van; Valois, P. de; Janssens, H.; Rijke, D. de
 219-224 (1979) [14 ref. En] [Naarden Res. Dep., Naarden-Bussum, Netherlands]
 The structure of thiamin and its primary degradation products are illustrated, and important degradation and hydrolysis pathways are considered. Apart from primary products, several other compounds have been found in heated thiamin solutions. 3 groups of volatiles are discerned; 9 volatile S compounds were identified, the presence of 3 compounds was confirmed (H_2S , 2-mercaptopentan-2-one, and 2-methyl-thiophene, which all occur in food) and 2 new compounds identified (3-mercaptopentan-2-one and 2-methylthiophene); 6 furans were found including 2 methylfuran and 2-methyl-3-methyltetrahydrofuran which are reported to occur in food; and 4 thiazoles (hydroxythiazole and alkylthiazoles) were found - all 4 are reported to occur in food. As to the formation of other compounds, 2-hydroxy-3-mercapto-2-pentanone is believed to be a key intermediate. SP

7

Formation of non-volatile flavour compounds. (In 'Monograph V. E.B.C.' [see FSTA (1980) 12 4H480].) [Lecture]
 Engan, S.
 40-50 (1978) [35 ref. En] [Brewing Ind. Res. Lab., Oslo 3, Norway]
 A short review is given of literature covering the formation of non-volatile flavour compounds during the fermentation of beer. The groups of compounds discussed are: nucleic acid derivatives, medium chain fatty acids, organic acids and carbonyl compounds. The effect of yeast growth on the formation of organic acids

and carbonyl compounds, particularly acetoin and acetolactate, is outlined. It is concluded that the excretion of acetaldehyde, pyruvic acid and acetoin seems to be closely connected to yeast growth but that growth is not the only factor that determines the peak value of these compounds. The excretion of acetolactate follows a different pattern indicating that this compound is regulated by other factors in the wort. AS

58

Formation of volatile flavour compounds: alcohols, esters, carbonyls, acids. (In 'Monograph V. E.B.C.' [see FSTA (1980) 12 4H480].) [Lecture]
 Engan, S.
 pp. 28-39 (1978) [29 ref. En] [A/S Hansa Bryggeri, N-5001 Bergen, Norway]

Different factors influencing the formation of beer volatiles during fermentation are dealt with. The importance of yeast strain, fermentation conditions and wort composition, especially the O_2 content of wort, is pointed out. It is stressed that conclusions must be drawn carefully, as results obtained with one yeast in one wort, and in one fermenting vessel, will not necessarily be the same if yeast and fermenting conditions are altered. AS

59

Determination of personal and group thresholds and the use of magnitude estimation in beer flavour chemistry. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194].) [Lecture]
 Meilgaard, M. C.; Reid, D. S.
 pp. 67-73 (1979) [13 ref. En] [Stroh Brewery Co., Detroit, USA]

Interpersonal variations in the flavour impact of 4 principal aroma volatiles (ethanol, dimethyl sulphide, diacetyl, isoamyl acetate) of beer were studied. The 4 compounds were added to a light lager beer. Difference thresholds were determined using the American Society for Testing Materials 'ascending methods of limits'. Each compound was purified by a multistep process. Thresholds were determined at each step until further purification produced no change in threshold or flavour character. Personal threshold were determined for each of 16-20 assessors and magnitude estimation was used to measure the flavour effect of the 4 compounds in the suprathreshold range (2-8 times threshold concn.). SP

60

[Gas chromatographic studies of aroma compounds of grapes. III. Significance of location for aroma composition of Riesling grapes.]

Gaschromatographische Untersuchungen über die Aromastoffe von Weinbeeren. III. Die Bedeutung des Standortes für die Aromastoffzusammensetzung der Rebsorte Riesling.

Rapp, A.; Hastrich, H.
Vitis 17 (3) 288-298 (1978) [15 ref. De, en]
 [Bundesforschungsanstalt für Rebenzüchtung, Geilweilerhof, D-6741 Siebeldingen, Federal Republic of Germany]

Riesling grapes from 9 locations and 4 harvest stages

(3 & 4) were processed into musts. Sugar (40-100 Oe) and titratable acidity of the 36 musts are tabulated. Aroma composition was investigated by gas capillary chromatography. Many chromatograms are tabulated to show that superimposed on a var.-specific 'fingerprint pattern' are fine patterns corresponding to location and ripeness stage. Multiple discriminant analysis using var.-specific variables could be used to differentiate Riesling from Morio-Muskat var. grapes. [See FSTA (1977) 9 8H1439 for part II.] DIH

61

[Quantitative composition of natural and technologically modified plant aromas. VI. Distribution and changes of aroma compounds during thermal concentration of orange juice.] Über die quantitative Zusammensetzung natürlicher und technologisch veränderter pflanzlicher Aromen. VI. Verteilung und Veränderungen von Aromastoffen bei der thermischen Konzentrierung von Orangensaft. Schreier, P.; Drawert, F.; Heindze, I. *Chemie Mikrobiologie Technologie der Lebensmittel* 6 (3) 71-77 (1979) [32 ref. De, en] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, Freising-Weihenstephan, Federal Republic of Germany]

Among 69 aroma substances identified in freshly pressed juice of Biondo oranges by gas chromatography/MS, 49 volatile compounds were determined by quantitative gas chromatography in both the juice and in conc. juices and condensates produced from them by a 2-stage evaporation process using a centrifugal evaporator (Centritherm, Alfa-Laval). Quantitative gas chromatography showed that the main part of the aroma substances passed into the condensate, especially after the 2nd evaporation step. In all the chemical substance groups, losses of aroma compounds were detected; these were quantitatively determined with regard to the different volatile components. The aroma compounds carvone, nootkatone, nerolido, *cis*- and *trans*-carveol as well as *cis*- and *trans*-2,8-menthadien-1-ol were newly formed during the evaporation process. [See FSTA (1978) 10 11]1547 for part V.] AS

62

[Quantitative composition of natural and technologically modified plant aromas. VII. Behaviour of aroma compounds during freeze concentration of orange juice.] Über die quantitative Zusammensetzung natürlicher und technologisch veränderter pflanzlicher Aromen. VII. Verhalten der Aromastoffe bei der Gefrierkonzentrierung von Orangensaft. Schreier, P.; Drawert, F.; Heindze, I. *Chemie Mikrobiologie Technologie der Lebensmittel* 6 (3) 78-83 (1979) [26 ref. De, en] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, Freising-Weihenstephan, Federal Republic of Germany]

Freeze concn. of freshly pressed orange juice (Biondo var.) was carried out on a pilot plant scale using a crystallization tube, a pump and a hydraulic press.

During the process, the different fractions were analysed by gas chromatography and determined quantitatively in the concentrates as well as in the separated ice. The main part of the aroma substances remained in the concentrate. Average loss of aroma compounds in the ice (not washed) was estimated to be around 12%. During freeze concn. carvone and α -terpineol were newly formed; small increases in concn. of nootkatone, geraniol and *trans*-2,8-menthadien-1-ol were also detected. [See preceding abstr. for part VI.] AS

63

[Aroma assessment of roast coffee.] Zur Aromabeurteilung bei Röstkaffee. Wurziger, J. *Chemie Mikrobiologie Technologie der Lebensmittel* 6 (2) 58-63 (1979) [De] [Bredkamp 43a, D-2000 Hamburg 55, Federal Republic of Germany]

A series of experiments is described in which raw or roasted coffee beans of different origin and also aqueous coffee extracts were steam-distilled and the distillate extracted with petrol ether or other solvents. When the extract was treated with ammonia or ammonium carbonate various colour reactions were observed which could be related to the preliminary treatment, although they did not enable a distinction to be made between Arabica and Robusta beans. The significance of these changes is discussed in relation to the known chemical constituents (e.g. chlorogenic acid) and also to the development of quality control measures for processed coffee, although no clear recommendations are presented. BDH

64

[Evaluation of the bouquet of wines by gas chromatography. V. Determination of the "watering" of wine and the degree of dilution.] Über die gaschromatographische Duftqualifizierung von Weinen. V. Nachweis einer Verwässerung und Bestimmung ihres Ausmasses.

Donath-Jobbagy, A.; Hollo, J. *Nahrung* 23 (8) 797-806 (1979) [2 ref. De, en, ru] [Inst. for Agric.-Chem. Tech., Tech. Univ., Budapest, Hungary]

A procedure for objective evaluation of the 'bouquet' of wines by GLC analysis of headspace volatiles followed by statistical evaluation of data for peak areas is described. The possible application of this technique to detection of dilution of wines with water was investigated; trials were conducted with samples of Bikaver wines diluted with $\leq 30\%$ water. Chromatograms and a table of results are given. Statistical methods used for analysis of the results are described in detail. The results show that this procedure is applicable to detection of addition of water to wine, and detn. of the degree of dilution with $\geq 10\%$ water. [See FSTA (1976) 8 11H1850 for part II.] IN

65

Aroma and compositional changes in wine with oxidation, storage and ageing.

Simpson, R. F. *Vitis* 17 (3) 274-287 (1978) [28 ref. En, de] [Australian Wine Res. Inst., Private Mail Bag, PO Glen Osmond SA 5064 Australia]

ples of Riesling wine were stored under oxidizing conditions (160 ml samples in 570 ml capacity bottles) at 50°C, or under anaerobic 'quick ageing' conditions (under N₂ at 50°C) and changes in headspace volatiles were studied by headspace gas chromatography after concentration on Chromosorb Q adsorbents. Individual components were identified by GC/MS. Tabulated results list components which increased in concn. as a result of each treatment. Ethyl acetate, C6, C8, C9 and C10 fatty acids increased in all treatments, as did ethyl lactate and diethyl succinate, ethyl propanoate and 1,1,6-trimethyl-1,2-dihydronaphthalene. Ethyl 9-decenoate increased in the 15°C treatment only, otherwise the 15°C treatment relatively resembled the 50°C oxidizing treatment. 2-ethanol increased in the oxidizing treatments and decreased in the quick-ageing treatment; benzaldehyde absent in quick-aged samples but was formed on oxidation. Flavour score of oxidized wine decreased with time of oxidation and correlated with extent of oxidation. Of the major volatile components studied, TDN rose to levels exceeding its flavour threshold, it is thought that flavour changes resulted from changes in concn. of many related compounds and not from minor intensely-flavoured compounds. Free aldehyde content of control wine was 46.8 mg/l; values after 28 days under different treatments were: 15°C oxidizing 46.8, 50°C oxidizing 64.6, 50°C N₂ 42.8. Overall changes in free aldehyde content (as opposed to individual aldehydes) provide little information as to oxidation or storage history. Quick ageing turned wines deep yellow, oxidation turned them brown; optical densities at 400, 420, 500, 600 and 700 nm are tabulated for the different treatments. It is concluded that GC/MS detn. of headspace volatiles of wine can provide useful information about extent of oxidation and ageing. DIH

Aroma compounds and other fruit contents of different strawberry varieties. Aromen und andere Inhaltsstoffe verschiedener Erdbeersorten. Beller, J.; Buchloh, G. *Gartenbauwissenschaft* 20 (9) 189-190, 192 (1978) [3 ref. De]. Universität für Obst-, Gemüse-, und Weinbau, Univ. Hohenheim, 7000 Stuttgart 70, Federal Republic of Germany. Strawberry var. were studied in a 4-yr trial of fruit composition. DM content varied with var. and age of fruit in the range 9.4-12.2%. Content of total sugar was 10.4-47.7% DM; plants cultivated 1 or 4 yr had lower sugar content than corresponding 2- or 3-yr old ones. Titratable acidity was 0.90-1.26 m-equiv./g DM; there was no correlation between acidity and sugar content with age. Colour intensity showed variety-specific differences, Zefyr and Hummi Grande having the most intense colour. Semi-quantitative indication of aroma compound content shows that Senga Sengana followed by Senga Gigana had the highest concn. of volatiles and Sella the lowest. Aroma compounds identified by headspace gas chromatography were ethylene, methyl-, ethyl-, propyl-, isobutyl- and amylacetate, heptanol, and isobutyl- and butylbutyrate. DIH

67

The evaluation of flavour quality in fruits and fruit products. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194].) [Lecture]

Williams, A. A. pp. 287-305 (1979) [63 ref. En] [Long Ashton Res. Station, Bristol, UK]

The 1st part of this paper deals briefly with some of the more important flavour compounds found in fruits and fruit products, drawing particular attention to some of the problems of evaluating the intrinsic flavour quality of fruit cv. The 2nd part of this paper explores the more difficult field of evaluating how these intrinsic flavour characteristics and others both chemical and physical in nature are related to hedonic quality and what the consumer actually wants. SP

68

Porous polymer trapping for GC/MS analysis of volatile flavor compounds in corn.

Boyko, A. L.

Dissertation Abstracts International, B 38 (11) 5256: Order no 78-05403, 26pp. (1978) [En] [Oregon State Univ., Corvallis, Oregon 97331, USA]

Flavour profiles of canned and frozen whole-kernel sweetcorn were obtained by entraining the volatile compounds on Porapak Q traps and subsequent analysis on temp.-programmed capillary columns (SF-96 or Carbowax 20M); identification was based on GLC/MS data, retention indices and retention times. New compounds identified in canned corn included pyridine, methional, dimethyl sulphoxide and dimethyl sulphone; various N, S and N-S heterocyclic compounds were also present. New compounds found in frozen corn included acetoin, 3-methyl-2-cyclohexenone and dimethyl sulphone. Qualitative and quantitative varietal differences were observed in both frozen and canned samples. Studies of model systems heated to simulate the corn canning process indicated that mixtures of water, sugars and S-containing amino acids produced the most corn-like aromas. JA

69

Volatile fatty acids produced by some of the bacteria occurring on cereals.

Kaminski, E.; Stawicki, S.; Wasowicz, E.; Giebel, H.; Zawirska, R.

Bulletin de l'Academie Polonaise des Sciences, Sciences Biologiques 27 (1) 7-12 (1979) [11 ref. En, ru]

The bacteria studied had been: (i) isolated from the surface of wheat grain immediately after harvest (*Pseudomonas trifolii*, *Ps. fluorescens*, *Lactobacillus plantarum*, *Sarcina* sp., *Escherichia coli*); (ii) isolated, usually from the interior of grain, after storage for 14 months at 10-12°C and 70-80% RH (*Bacillus subtilis*, *B. megaterium*, *Clostridium* strains); or (iii) isolated from the interior of grain containing > 20% moisture (*Propionibacterium* sp.). Sterilized coarse wheat and maize grains (moisture content 60-70%) were inoculated with 1 of the above bacteria (approx. 200 000 cells/g) and incubated, either with or without aeration, at 30°C for ≤ 72 h. Bacterial growth and volatile fatty acid (C2-C6; VFA) production during

incubation were studied. Results indicated that the quantitative and qualitative composition of VFA changed during bacterial growth and also differed between the bacterial spp. and between the 2 grain spp. On the basis of the results obtained, it is concluded that most of the bacteria studied (especially *Bacillus* and *Clostridium* spp.) are capable of producing VFA on cereal grains; such acids (especially isobutyric and isovaleric) can produce off-odours in these grains, and may be responsible for the characteristic off-odour of deteriorated stored grain. JA

70

Flavour formation in dairy products. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture] Dumont, J. P.; Adda, J. pp. 245-262 (1979) [58 ref. En] [Cent. Nat. de Recherches Zootechniques, Jouy-en-Josas, France]

Flavour formation in dairy products is described under the following headings: flavour compounds in milk, covering flavour compounds formed in milk before processing, and flavour compounds resulting from the action of heat on milk; flavour formation during manufacture of dairy products, including compounds originating from lactose and citrate metabolism (cultured dairy products, cheeses, cheddar cheese, and swiss and gruyere types of cheese), compounds originating from protein metabolism (the dried casein model, and cheeses), flavour compounds originating from lipids (non-enzymic oxidation of butterfat, enzymic mechanisms, including lipolysis, carbonyl formation, alcohols, and lactones), flavour compounds originating from secondary reactions between primary volatile components (esterification, and components formed by reactions involving addition of S compounds) and other flavour components; and will flavour research lead to improvement of cheese quality? SP

71

Flavour news.

International Dairy Federation

Flavour News No. 1, 7pp. (1979) [En] [41, Square Vergote, 1040 Brussels, Belgium]

This first issue of *Flavour News* is compiled by the IDF General Secretariat from papers made available by members of Group F2 dealing with Flavour in Milk and Milk Products. In the initial phases of flavour research, instrumental analyses were of primary importance in establishing the type of compounds that contribute to the formation of aromas. Research is now directed towards a range of complementary techniques of sensoric assessment. A brief outline is given of some applications of sensory panels in flavour research at the Food Research Institute, Agriculture Canada, at the National Institute for Research in Dairying, Reading, UK, and at INRA, Jouy-en-Josas, France. MEG

72

Interactions of low molecular weight adsorbates on lactose.

Marvin, J. W.; Bernhard, R. A.; Nickerson, T. A.

Journal of Dairy Science 62 (10) 1546-1557 (1979)

[13 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

Adsorptive behaviours of several low mol. wt. compounds (commonly associated with food flavour) onto stable anhydrous α -lactose were studied. Aromatic hydrocarbons (toluene and ethylbenzene) were adsorbed the least, while alcohols (1-pentanol and 1-octanol) were adsorbed in greatest amounts; esters and ketones showed intermediate adsorption. Studies were also made on adsorption and desorption of 1-hexanol over a 10 month period, and on simultaneous adsorption of multicomponent systems on lactose. Alcohols were preferentially adsorbed from a mixture of alcohols and aromatic hydrocarbons. These studies suggest that there are 2 active sites for adsorption on the lactose molecule; their spatial relationship is discussed. There appeared to be a finite limit to the amount of test compound adsorbed on lactose under the experimental conditions used. MEG

73

Progress in flavour research. [Book]

Land, D. G.; Nursten, H. E. (Editors)

xvi + 371pp. ISBN 0-85334-818-9 (1979) [many ref. En] Barking, Essex, UK; Applied Science Publishers Ltd. Price £22.00 [Food Res. Inst., Norwich, Norfolk, UK]

This book is the Proceedings of the 2nd Weurman Flavour Research Symposium held at the University of E. Anglia, Norwich, 2-6 April, 1978. Chapters include: 1. Sensory characterization of the flavour of beer, by J. F. Clapperton (pp. 1-14, 26 ref.). 2. Sensory methods in the work of the flavour chemist, by M. Seidman (pp. 15-26, 5 ref.). 3. Application of anatomical and psychophysical methods to studies of odour interactions, by D. G. Laing & H. Panhuber (pp. 27-46, 45 ref.). 4. Some psychophysical notes on the use of the odour unit number, by J. E. R. Frijters (pp. 47-51, 22 ref.). 5. Some factors influencing the perception of flavour contributing substances in food, by D. G. Land (pp. 53-66, 42 ref.). 6. Determination of personal and group thresholds and the use of magnitude estimation in beer flavour chemistry, by M. C. Meilgaard & D. S. Reid (pp. 67-73, 13 ref.). 7. An approach to meat flavour research with evaluation by the dog and cat, by P. Booth (pp. 75-77, 3 ref.). 8. Review of isolation and concentration techniques, by J. M. H. Bemelmans (pp. 79-98, 50 ref.). 9. Application of gas and thin-layer chromatography in flavour analysis, by A. M. Humphrey (pp. 99-118, 6 ref.). 10. Recent studies in flavour chemistry and related fields undertaken in the food research laboratory of CSIRO, by F. B. Whitfield & K. E. Murray (pp. 119-127, 20 ref.). 11. Deactivation of a metal transfer line between a gas chromatographic column and a flame photometric detector, by J. W. Gramshaw & A. Hussain (pp. 129-131, 15 ref.). 12. Developments in mass spectrometry, by R. Self (pp. 135-143, 49 ref.). 13. Applications of alternative scan positive ion-negative ion chemical ionisation in gas chromatography-mass spectrometry, by S. Evans & R. Skinner (pp. 145-149, 8 ref.).

[Continued in following abstract] SP

Progress in flavour research. [Book]

Land, D. G.; Nursten, H. E. (Editors)

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Barking, Essex, UK; Applied Science Publishers Ltd.

Price £22.00 [Food Res. Inst., Norwich, Norfolk, UK]

[Cont. from preceding abstract.] 14. Optimised coupling techniques for gas chromatography-mass spectrometry in flavour research, by U. Rapp, M. Höhn & G. Dielmann (pp. 151-158, 2 ref.). 15. Review of biosynthesis of volatiles in fruits and vegetable since 1975, by C. E. Eriksson (pp. 159-174, 54 ref.). 16. The role of microorganisms in flavour formation by P. Schreier (pp. 175-196, 72 ref.). 17. Chemical formation of flavour substances, by R. Tressl, K. G. Grünewald, R. Iwar, & D. Bahri (pp. 197-213, 53 ref.). 18. Differences between the volatile compounds of cultivated and wild strawberries (*Fragaria vesca* L.), by T. Pyysalo & E. Honkanen (pp. 215-218, 12 ref.). 19. Volatile components from thermally degraded thiamine, by L. M. van der Linde, J. M. van Dort, P. de Valois, H. Boelens & D. de Rijke (pp. 219-224, 14 ref.). 20. Factors affecting flavour during growth, storage and processing of vegetables, by G. G. Freeman (pp. 225-243, 47 ref.). 21. Flavour formation in dairy products, by J. P. Dumont & J. Adda (pp. 245-262, 58 ref.). 22. Reduction of cooked flavour in heated milk and milk products, by H. T. Badings (pp. 263-265, 2 ref.). 23. Changes in flavour compounds of black pepper during heat sterilization, by H. Maarse & L. M. Nijssen (pp. 267-274, 15 ref.). 24. The formation of metallic taint by selective lipid oxidation: the significance of octa-1, cis-5-diene-3-one, by P. A. T. Swoboda & K. E. Peers (pp. 275-279, 15 ref.). 25. The glucosinolates of two species of *Farsetia*, by V. Gil & A. J. MacLeod (pp. 281-285, 5 ref.). 26. The evaluation of flavour quality in fruits and fruit products, by A. A. Williams (pp. 287-305, 63 ref.). 27. Meat flavour and consumer acceptability, by D. N. Rhodes (pp. 307-319, 6 ref.). 28. The bitterness of protein hydrolysates, by J. P. Roozen (pp. 321-326, 11 ref.). 29. Problems in flavour application in food systems, by B. King, R. Wyler & J. Solms (pp. 327-335, 12 ref.). 30. Why flavour research? How far have we come since 1975 and where now? by H. E. Nursten (pp. 337-355, 44 ref.). A 9 pp. subject index is also included. Chapters 1, 3, 5, 6, 9, 11, and 14-29 are abstracted separately in FSTA and are listed in the author index under Weurman Flavour Research Symposium [2nd Symposium]. SP

75

The nature, description and biosynthesis of volatiles of *Cinnamomum* spp.

Senanayake, U. M.

Dissertation Abstracts International, B 38 (10) 4716 (1978) [En]

Distribution, commercial aspects and chemical composition of *Cinnamomum* spp. in general and *C. zeylanicum*, *C. cassia* and *C. camphora* in particular are reviewed. GC studies of steam distilled, commercial leaf, stem bark and root bark oils of *C. zeylanicum* revealed the presence of > 75 volatile compounds in each type of oil. Volatile composition of leaf and root bark oils is unaffected with age, while that of stem bark

oils is unaffected with age, while that of stem bark oil varies slightly with age, the stem bark oil from 2½ old plants having more terpenoids and less cinnamic aldehyde. *C. cassia* oil has predominantly aromatic (benzene ring) compounds, such as cinnamic aldehyde; *C. camphora* oil has mainly terpenoid compounds, such as camphor and cineole. The biosynthetic pathways of the major volatiles of *C. zeylanicum* are examined. All parts of the *C. zeylanicum* plant are capable of synthesising the major volatiles found in the cinnamon oils, however, the leaf is the predominant site of eugenol and cinnamic aldehyde synthesis. VJG

76

Differentiation of the aroma quality of soy sauce by statistical evaluation of gas chromatographic profiles.

Aishima, T.; Nagasawa, M.; Fukushima, D.

Journal of Food Science 44 (6) 1723-1727, 1731 (1979)

[En] [Noda Inst. for Sci. Res., Noda-shi, Chiba-ken, Japan]

Stepwise discriminant analysis (SDA) and principal component analysis (PCA) were applied to quantitative gas chromatographic (GC) profiles of soy sauce volatiles in order to compare soy sauce quality evaluated by sensory evaluation with GC data. Although the brands of soy sauce were roughly separated into 4 groups on the basis of canonical score with the same tendency of the sensory rank, SDA correctly classified each sample into the proper group of the 8 groups. 6 PC among 8 factors extracted from the selected 39 peaks by the PCA showed significant relationships with the sensory evaluation in multiple regression analysis. The first PC showed a 55% contributing proportion. The importance of harmonious balance of each aroma compound for the aroma quality was evident from a comparison of the 6 PC. IFT

77

Classification of soy sauce on principal components in GC profiles.

Aishima, T.

Agricultural and Biological Chemistry 43 (9) 1905-1910 (1979) [18 ref. En] [Noda Inst. for Sci. Res., Noda-shi, Chiba-ken, Japan]

Discrimination of soy sauce samples from 8 different brands on the basis of principal components from GLC profiles of aroma concentrates was performed by stepwise discriminant analysis. On the basis of results from sensory evaluation, classification of samples into 8, 3, and 2 groups was examined. Statistically significant difference was found among the 8 brands on the basis of principal components. The 3 groups, consisting of good, standard and inferior samples were also classified correctly. Completely correct 2 way discrimination into good and bad groups, was accomplished in the same manner. These clear classifications suggested that evaluation and discrimination in sensory tests were performed by comparing the profiles of aroma substances. AS

78

Objective evaluation of soy sauce by statistical analysis of GC profiles.

Aishima, T.

Agricultural and Biological Chemistry 43 (9) 1935-1943 (1979) [24 ref. En] [Noda Inst. for Sci. Res., Noda-shi, Chiba-ken, Japan]

The relationships between GLC data of volatiles and sensory score of the highest grade of soy sauce (Tokusen shoyu) were analysed by multivariate analyses. Samples belonging to 4 brands could be unambiguously classified into the correct brands and the statistical distance among them suggested a close relation with sensory evaluation. The precise predictive equations for the aroma quality were calculated from GLC data and sensory evaluation by multiple regression analysis. 8 principal components (PC) were extracted from 39 GLC peaks as significant factors constituting soy sauce aroma. The 2nd PC can explain 58% of the variation among total variation contained in the sensory score. Discriminant functions on the basis of the 8 PC can clearly classify all samples. [See also preceding abstr.] AS

79

Perfumery and flavor materials. [Review]

Bedoukian, P. Z.

Perfumer & Flavorist 4 (2) 1, 3-10, 12, 14-16 (1979)

[217 ref. En] [Bedoukian Res. Inc., Danbury,

Connecticut, USA]

Recent research in essential oils, synthetic aroma chemicals and flavours is reviewed, including: apple, peach, pear, redcurrant, mango, guava, papaya, wildberry, tomato, carrot, artichoke, black tea, liquorice, sponge cake, white bread, cheese, potato chips, mushrooms, rice, olive oil, pecan oil, butterfat, various cooking oils, meat, smoked meat products, and Tahiti vanilla beans. Review articles and books are included in the bibliography. RM

80

Chemical formation of flavour substances. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture]

Tressl, R.; Grünwald, K. G.; Silwar, R.; Bahri, D. pp. 197-213 (1979) [53 ref. En] [Forschungsinst. für Chem. Tech. Analyse der Tech. Univ. Berlin]

Maillard-type reactions covering formation of caramel compounds, formation of aroma components from Strecker aldehydes, formation of N-heterocyclic components from proline and hydroxyproline, and formation of aldimines, amines and cyclopentapyrazines; and thermal and oxidative degradations covering thermal degradation of phenolic acids, thermal degradation of unsaturated fatty acids and S-containing compounds and thermal oxidative degradation of carotenoids, are discussed. SP

81

Problems of flavour application in food systems. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture]

King, B.; Wyler, R.; Solms, J. pp. 327-335 (1979) [12 ref. En] [Dep. of Food Sci., Swiss Fed. Inst. of Tech., Zürich, Switzerland]

Examples are given to demonstrate that the application of flavour compounds to food systems reveals fascinating interaction effects. Model food systems described include: a heterogeneous lipid-water mixture using benzyl alcohol as the flavour substance and butter as the lipid phase; a denatured insoluble protein in aqueous suspension, using denatured soy protein isolate and denatured bovine serum albumin with benzyl alcohol as the flavour substance; and polysaccharide-water systems using starch. SP

82

Changes in flavour compounds of black pepper during heat sterilisation. (In 'Progress in flavour research' [see FSTA (1980) 12 4T194]) [Lecture]

Maarse, H.; Nijssen, L. M.

pp. 267-274 (1979) [15 ref. En] [Cent. Inst. for Nutr. & Food Res., TNO, Zeist, Netherlands]

Volatiles of black pepper were isolated and extracted, (i) in unheated water and extracted directly with pentane-ether (2:1 v/v), (ii) in water sterilized at 120°C followed by extraction with pentane-ether (2:1) or (iii) steam distilled and extracted with pentane-ethers (2:1) using the Likens-Nickerson apparatus. Volatile compounds in (i)-(iii) were separated on a packed Carbowax 20M column; changes in composition of black pepper volatiles during sterilization and steam distillation are tabulated and discussed. SP

83

Flavour significant compounds in yeast autolysate Gistex X-II powder. I. Acidic fraction.

Davidek, J.; Hajslova, J.; Kubelka, V.; Velisek, J.

Nahrung 23 (7) 673-680 (1979) [43 ref. En, de, ru] [Dep. of Food Chem. & Analysis, Prague Inst. of Chem. Tech., Prague, Czechoslovakia]

Studies were conducted to identify substances responsible for the aroma of the yeast autolysate Gistex X-II. GLC-MS analysis revealed the presence of 29 compounds in the acidic fraction of the autolysate, most being products of yeast metabolism. Sensory testing showed that, apart from low mol. wt. fatty acids (acetic, butyric and isovaleric acids being responsible for, resp., 12.3, 10.3 and 16.5 of the total aroma intensity) phenylacetic acid and 3-phenylpropionic acid were of importance for aroma. Two S-containing heterocyclic acids (2-thiophenecarboxylic acid and 5-methyl-2-thiophenecarboxylic acid) were detected for the first time in foods. These and 6 other S- or O-containing heterocyclic acids (including 2-furylacetic acid, 5-methyl-2-thienylacetic acid, 5-methyl-2-furancarboxylic acid and other acetic acid or propionic acid derivatives) were investigated, their aroma characteristics, odour threshold values and mass spectra being studied. JN

84

Molecular encapsulation of volatile, easily oxidizable labile flavour substances by cyclodextrins.

Szejtli, J.; Szenté, L.; Banky-Elöd, E.

Acta Chimica Academiae Scientiarum Hungaricae

01 (1/2) 27-46 (1979) [11 ref. En] [Chinoi Pharmaceutical & Chem. Works, Biochem. Res. Lab., Budapest, Hungary]

β -Cyclodextrin inclusion complexes of 25 various flavour substances (spice aromatics and essential oils of vegetable origin, e.g. oils of onion, dill, lemon, garlic, marjoram, peppermint, tarragon) were prepared. The crystalline complexes contained 8-13% included substance, as determined by GLC. All major components of the original substances were present in the complexes, with practically unchanged composition. The fact of complex formation was proved by X-ray diffraction and stability tests. The O_2 uptake of the flavour substances, measured by Warburg's method, was reduced to about one tenth by complexation. Volatile components are released from the complexes only above 160°C , thus under normal storage conditions the volatility, oxidation and heat-decomposition are reduced to such an extent that the product can be stored for a long time without lessening its utility. These complexes can be used in the food industry as microbiologically noncontaminated, stable aromatic preparations of standardized composition. AS

85

[Separation of natural compounds by gel permeation or a pre-column, especially for capillary GLC.]

Trennung von Naturstoffen unter Verwendung der Gelpermeationstrennung oder einer Vorsäule, speziell für die Analytik der Kapillar-Gaschromatographie. Deuber, A.; Brandauer, H.; Ziegler, E. *Chromatographia* 12 (11) 737-739 (1979) [9 ref. De, en] [Aromachemie, D-8551 Ansfess, Federal Republic of Germany]

GLC separation of natural products is upset by non-volatile compounds. Problems arise from thermal and catalytic cracking in the injector, and from ghost peaks and base line drift. A method is shown for improving citrus analysis by using simple gel permeation chromatography (Sephadex LH 20, with isopropanol solvent) for pre-separation. A second method describes the separation of the high mol. wt compounds with a GLC pre-column. A simple conversion of the GLC apparatus is shown. The procedure is illustrated with the elution curve and GLC chromatogram for mandarin oil. [From En summ.] RM

86

[Spectrophotometric determination of eugenol in essential oils.] Spektrophotometrische Bestimmungen von Eugenol in ätherischen Ölen.

Anon. *Riechstoffe, Aromen, Kosmetika* 29 (11) 254 (1979) [5 ref. De]

A method is described for determining eugenol in essential oils with an error of 0.04% by colour reaction of the alcoholic extract with CuCl_2 , and absorption at 520 nm. RM

87

The use of glass capillary columns for food and essential oil analysis.

Jennings, W.

Journal of Chromatographic Science 17 (11) 636-639 (1979) [7 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California 95616, USA]

Some of the wide-ranging applications of glass capillary gas chromatography to the analysis of foods and essential oils are briefly surveyed, with mention of peppermint oil, California juniper essential oil, reaction products of a glucose- H_2S - NH_3 model system, separation of methyl esters of some fatty acids and hydroxy fatty acids produced by yeast cultures, and banana and cantaloupe headspace vapours. AL

88

A chemometric study of some beer flavour components.

Jacobsen, T.; Volden, R.; Engan, S.; Aubert, O. *Journal of the Institute of Brewing* 85 (5) 265-270 (1979) [14 ref. En] [Brewing Industry Res. Lab., Oslo, Norway]

Factor analysis was used to evaluate chemical composition of Norwegian beers produced under various conditions, and thus determine whether components would form distinct groups (factors) characteristic of brewing conditions or process variables. Beers investigated were from 2 breweries, brewed on a laboratory scale or pilot scale, at 8° , 10° or 12°C , with the breweries' own yeast or 1 of 2 other strains. Flavour components isolated by head-space techniques or carbon disulphide extraction were determined by GLC, and mean levels and ranges of 14 flavour compounds in the 2 groups of beers (the 2 breweries) are tabulated. Factor analysis results are given in tabular and graphical form. Flavour components may be divided into at least 3 factors which contain information on the following compounds: (i) acetate esters + phenylethanol, (ii) fatty acids, and (iii) fatty acid esters. (i)-(iii) also contain information on higher alcohols. (i) can be used to rank beers according to fermentation temp., and provide information as to yeast strain. (ii) and (iii) can distinguish between breweries and full scale and laboratory scale brews. DIH

89

Processing effects on the sensory acceptability and the volatile composition of tomato juice concentrate.

Lever, C. A.; Matthews, R. F.

Proceedings of the Florida State Horticultural Society 91, 151-153 (1978) [11 ref. En] [Univ. Iberoamericana, Avenue Cerro de las Torres 395, Mexico 21]

Tomato juice concentrate was prepared from tomato juice of the 'Walter' cv. Volatile distillate was collected and processed to an aqueous essence. The concentrate was modified by the addition of single-strength canned tomato juice, the addition of aqueous essence, and the addition of single strength juice plus essence. The concentrate plus juice received the highest sensory acceptance rating. The addition of essence reduced the sensory panel acceptance rating of the concentrate. Volatile compounds monitored in the original tomato juice were reduced approx. $3-4 \times$ by the concn. procedure. AS

90

Subjective and objective evaluation of strawberry pomace essence.

Schen, J. A.; Montgomery, M. W.; Libbey, L. M. *Journal of Food Science* 45 (1) 41-46 (1980) [En] [Dep. of Food Sci. & Tech., Oregon State Univ., Corvallis, Oregon 97331, USA]

Relationship of incubation parameters (time, temp., and pH) to intensity and quality of the aroma of essences distilled from a commercial strawberry pomace was studied. Analysis of variance of sensory panel scores indicated that incubation temp. of the pomace prior to distillation affected the intensity and quality of essence aroma more than holding time or pH. Aroma intensity showed a marked decrease as pH of incubation of the pomace was increased above pH 4.0. Sensory panels detected statistically significant differences ($P < 0.01$) in quality of aroma of essences obtained from pomace incubated above pH 4.0 at 20-50°C. Optimum intensity and quality of essence production was obtained in pomace adjusted to pH 4.0 and incubated at 40°C for ≥ 4 h. Gas chromatographic (GC) analysis of several essences collected from strawberry pomace processed under different conditions revealed dissimilar patterns. Essences of highest quality, as determined by the sensory panel, had GC patterns similar to that of essence produced from whole strawberries. All essences obtained from strawberry pomace contained high concn. of benzaldehyde, 2-heptenal, ethyl hexanoate, limonene, 2-octenal, linalool, benzyl acetate, and ethyl cinnamate. Presence of these compounds may be responsible for the reduced quality of essence produced from strawberry pomace. IFT

91

The production of volatile compounds by filamentous fungi.

Collins, R. P.

Developments in Industrial Microbiology 20, 239-245 (1979) [26 ref. En] [Univ. of Connecticut, Storrs, Connecticut 06268, USA]

The major groups of filamentous odour-producing fungi are reviewed, including some of the more interesting odorous compounds produced. Published results from the study of other fungi (dried *Boletus edulis*, volatiles in *Agaricus bisporus* and *Psalliota bisporus*) are quoted. RM

92

No off-flavor associated with Imidan-treated blueberries.

True, R. H.; Forsythe, H. Y., Jr.; Barden, E. S. *HortScience* 13 (2) 154-155 (1978) [4 ref. En] [Univ. of Maine, Orono, Maine 04473, USA]

Imidan 50-WP was applied with a hand sprayer at the rate of 224 kg in 568 l/ha on July 23 and Aug. 14, 1975, and the berries were harvested Aug. 18 and held at 45°F until tested on Aug. 19 and 21. No significant flavour difference was found between the mean scores of the coded untreated control and the Imidan-treated blueberries at the 5% probability level of detection. The

tested rate of Imidan application therefore showed no association with off-flavours or flavour impairment of lowbush blueberries. VJC

93

[Biosynthesis of esters in fruit volatiles. IV. Oxidation of added alcohol to acid in banana pulp, and specificity of acid in its esterification.]

Ueda, Y.; Ogata, K.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 25 (8) 440-445 (1978) [9 ref. Ja, en] [Lab. of Processing & Physiol. of Hort. Products, Coll. of Agric., Univ. of Osaka Prefecture, Sakai-shi, Osaka 591, Japan]

When disks of banana pulp were incubated with vapour of alcohols (propyl, isobutyl, butyl, isoamyl, and amyl alcohol), they produced not only the acetate ester of the alcohol, but also other esters with acids which were converted from added alcohols (propyl propionate, isobutyl isobutyrate, butyl butyrate, isoamyl isovalerate, and amyl valerate). This indirect esterification of added alcohols occurred strongly with straight-chain alcohols and weakly with branched alcohols. When straight-chain acids were added to the disks of banana pulp, conversion rate to esters was higher than the rate for branched acids. Since butyryl CoA and isobutyryl CoA showed similar extents of esterification, the difficulty of conversion of branched-chain acids to esters may be found in the step of acyl CoA formation. These results help to explain why banana volatile esters consist mainly of acetate and butyrate acid moieties and isobutyl and isoamyl alcohol moieties. AS

94

[Quantitative determination of some important flavour components in dairy products by the headspace technique.] Quantitative Bestimmung einiger wichtiger Aromakomponenten in Milcherzeugnissen mittels Head-Space-Technik. Hild, J.

Milchwissenschaft 34 (5) 281-283 (1979) [9 ref. De, en] [Chemisches Untersuchungsamt der Stadt Hagen, Federal Republic of Germany]

Acetaldehyde, ethanol, acetone and diacetyl content were determined by head space analysis in yoghurt, bioghurt and in similar products mixed with fruit. Typical flavours were assessed by acetaldehyde content (yoghurt, 5-7 mg/kg; bioghurt, 3-5 mg/kg); mean ethanol and acetone contents in normal products were 0.6-2.4 mg/kg with diacetyl content of 4 mg/kg. Yeasty and contaminated products were identified by their higher acetaldehyde but especially by their higher ethanol content. 1 spoiled sample of bioghurt contained 5936 mg ethanol/kg. The above method may be used to substantiate the subjective sensory evaluation of dairy products. ASe

95

[Studies on natural flavouring substances. IV. Properties of the cooking flavours of chicken fractions.]

Ishida, K.; Yamamoto, A.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 25 7) 367-373 (1978) [15 ref. Ja, en] [Tokyo Res. Lab., Kyowa Hakko Kogyo Co. Ltd., Machida-shi, Tokyo, Japan]

The properties of cooking flavours of chicken fractions (lean meat, skin and adipose tissue) were investigated. The flavours were evaluated by sensory testing, gas chromatography, and detn. of H_2S and volatile reducing substances (VRS). The cooking flavour of chicken lean meat was best, and was intensified by blending with skin or adipose tissue. The strongest chicken flavour and a large amount of H_2S and VRS were produced from the water soluble protein (sarcoplasmic protein) fraction of lean meat. Chicken-like aroma and a small amount of H_2S and VRS were also produced by cooking of the salt-soluble protein (myofibrillar protein) fraction and the stroma fraction. Therefore, it may be assumed that these protein fractions also contribute to the production of cooking flavour of chicken. The strength of chicken aroma and the amount of VRS produced during cooking were decreased by defatting the lean meat and the skin. It was confirmed that taste substances were retained in the aqueous fraction of chicken broth, and aroma substances in the oil fraction. These results suggest that the combined use of these 2 fractions is desirable in seasoning manufacture. AS

96

Flavor of foods and beverages. Chemistry and technology. [Conference proceedings] Charalambous, G.; Inglett, G. E. (Editors) (United States of America, American Chemical Society, Division of Agricultural & Food Chemistry) xiii + 422pp. ISBN 0-12-169060-1 (1978) [many ref. En] London, UK; Academic Press, Inc. (London) Ltd. Price £16.90 [Anheuser Busch, Inc., St Louis, Missouri, USA]

This book contains the proceedings of a conference sponsored by the Agricultural and Food Chemistry Division of the American Chemical Society, and held in Athens, Greece, on June 27-29, 1978. The aim of the conference was to bring together existing information on the flavour of foods and beverages. Papers presented include: Flavor modification, by C. E. Eriksson (pp. 1-14, 51 ref.) [which reviews the procedures involved in deliberate flavour modification]. Flavor problems in the application of soy protein materials as meat substitutes, by G. A. M. van den Ouweland & L. Schutte (pp. 33-42, 20 ref.). Flavoring vegetable protein meat analogs, by R. F. Heinze, M. B. Ingle & J. F. Reynolds (pp. 43-56, 16 ref.) [which discusses the development of characteristic meat flavours and their application in analogues]. Some recent advances in the knowledge of cheese flavour, by J. Adda, S. Roger & J.-P. Dumont (pp. 65-74, 24 ref.); Flavor aspects of chocolate, by D. Reymond & W. Rostagno (pp. 75-79, 25 ref.). Cocoa substitution, by W. Grab, W. Brugger & D. Taylor (pp. 81-90); Intense sweetness of natural origin, by G. E. Inglett (pp. 97-112, 74 ref.) [which discusses phylloolulcin, stevioside, glycyrrhizin, Lo Han fruit (*Momordica grosvenori*) osladin, miracle fruit (*Synsepalum dulcificum*) serendipity berries (*Dioscoreophyllum cumminsii*) and katemfe

(*Thaumatococcus daniellii*)]. Formation of lactones and terpenoids by microorganisms, by R. Tressl, M. Apetz, R. Arietta & K. G. Grünwald (pp. 145-168, 29 ref.). The volatile fraction of orange juice. Methods for extraction and study of composition, by J. Alberola & L. J. Izquierdo (pp. 283-304, 94 ref.). The aroma composition of distilled beverages and the perceived aroma of whisky, by P. Journela-Eriksson (pp. 339-354, 26 ref.). Wine flavour, by P. Ribereau-Gayon (pp. 355-380, 14 ref.). A further 14 papers are abstracted separately and listed in the author index under United States of America, American Chemical Society, Division of Agricultural & Food Chemistry [Flavour Symposium]. JA

97

[Importance and development of aroma research.] Bedeutung und Entwicklung der Aromaforschung. Rothe, M.

Nahrung 24 (1) 7-19 (1980) [3 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

Aspects discussed include: increases in the number of aroma and flavour compounds identified in foods; developments in chromatographic and spectrometric analytical techniques; trends in consumer demand for strongly- and weakly-flavoured foods; losses and alterations in flavours of foods as a result of modern processing methods; flavour defects of dietetic foods; reactions responsible for aroma formation in foods; isolation and production of flavour concentrates; and the interrelation between analytical data and sensory characteristics. IN

98

Flavor interactions with food ingredients from headspace analysis measurements. (In 'Flavor of foods and beverages' [see FSTA (1980) 12 6A363]) [Lecture]

Saleeb, F. Z.; Pickup, J. G. pp. 113-130 (1978) [15 ref. En]

Quantitative headspace analysis of volatile organic compounds in equilibrium with food ingredients can be used to investigate the nature of flavour interactions. The headspace concn. of a given volatile compound at a given temp. is governed by the nature and energy of interaction of that particular volatile compound with the substrate; measurements of the temp. and headspace concn. can be used to determine whether the volatile compounds are present as solutes absorbed in liquid and solid substrates or are held by adsorption forces. Headspace analysis was used to investigate the nature of interaction between 4 volatile compounds (α -pinene, pyridine, ethyl acetate, methyl ethyl ketone) and 5 typical food ingredients, namely corn oil, Klucel GF (hydroxypropyl cellulose), pectin, Capsul (a modified food starch) and polyvinyl pyrrolidone. Results obtained indicated that the 4 volatile compounds are physically adsorbed onto the solid food ingredients, while in the liquid ingredient (corn oil) the volatile compounds are retained by absorption. The calculated isosteric heats of adsorption are generally higher than the corresponding heat of liquefaction for

the volatile compounds; with corn oil, the calculated heats of sorption are equal to or less than the corresponding latent heat of vaporization. JA

99

Volatile odour substances produced by microflora. Kaminski, E.; Stawicki, S.; Wasowicz, E.; Kasperek, M. *Nahrung* 24 (2) 103-113 (1980) [45 ref. En, de, ru] [Dep. of Food Sci. & Tech., Univ. of Agric., Poznan, Poland]

Studies were conducted on formation of volatile odour substances by pure cultures of various moulds and bacteria grown on coarse wheat meal for 72 h at 30°C; the odour of the cultures was evaluated organoleptically, and volatiles were analysed by GLC. Tables of results are given. The principal component formed by moulds was 1-octen-3-ol; this is also present in both wild and cultivated edible fungi. The principal component formed by bacteria was acetoin. Approx. 50 further volatiles were formed by bacteria and/or moulds. Possible practical applications of these results are discussed, with special reference to preparation of aroma concentrates, and possible use of concn. of volatile metabolites as an index of microbial growth. IN

100

[Correlations between measurable properties and flavour.] [Review] Cantarelli, C.

Industria Alimentari 18 (12) 869-879 (1979) [25 ref. It] [Istituto di Tecnol. Alimentari, Univ. di Milano, Milan, Italy]

Aspects covered in this review include definitions in the "flavour" field, analytical problems of "flavour" analysis, and the development of a 123-point scheme for global quantification of "flavour" quality. Chromatograms and tabulated data for flavour analysis of a range of foods are included. HBr

101

[The volatile fraction of orange juice. I. Sensory and chemical methods of analysis.] [Review] Alberola, J.; Izquierdo, L.

Revista de Agroquímica y Tecnología de Alimentos 19 (2) 180-202 (1979) [many ref. Es, en] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

This review discusses physical and chemical factors affecting the odour and aroma properties of fruit juices and of orange, and the main sensory and chemical methods of studying aroma volatiles. RM

102

[Aroma origin in alcoholic beverages.] Ursprung des Aromas in alkoholischen Getränken. [Review] Suomalainen, H.; Lehtonen, M.

Nahrung 24 (1) 49-61 (1980) [37 ref. De, en, ru] [Res. Lab. of the State Alcohol Monopoly, Helsinki, Finland]

Aspects covered in this review include: the relatively minor significance of the raw materials for the flavour and aroma of alcoholic beverages; the importance of the yeast and the fermentation conditions for aroma

formation; formation of fusel alcohols, fatty acids and esters; formation of minor constituents (phenols, and S- and N-compounds) by yeasts; uptake of lactones and some phenolic compounds from the wood of casks used for maturation of some alcoholic beverages; changes in flavour and aroma compounds during ageing of spirits; and flavoured spirits (containing e.g. angelica, marjoram, coriander seeds or juniper berries). IN

103

Application of property-activity relationships, and structure-activity relationships to flavour research. I. Gardner, R. J.

Technical Quarterly, Master Brewers' Association of the Americas 16 (2) 106-110 (1979) [29 ref. En, es] [Group R&D Lab., Harp Lager Ltd., Manor Park, Alton, Hampshire, UK]

The concepts of quantitative property-activity relationships and structure-activity relationships are introduced and their possible applications in flavour research discussed. Property-activity relationships may be useful in predicting thresholds in series of compounds of similar structure, or taste, and simplify the storage and recall of flavour data. Some simple relationships between flavour threshold concn. and mol. wt. are developed for homologous series of compounds in beer to illustrate the approach. AS

104

Possibilities of characterizing wine quality and vine varieties by means of capillary chromatography. (In 'Flavor of foods and beverages' [see FSTA (1980) 12 6A363]) [Lecture]

Rapp, A.; Hastrich, H.; Engel, L.; Knipser, W. pp. 391-417 (1978) [42 ref. En] [Bundesforschungsanstalt für Rebenzüchtung Geilweilerhof, 6741 Siebeldingen, Federal Republic of Germany]

This report surveys studies carried out in recent yr by the authors with the aim of characterizing wine quality and vine var. from their contents of volatile compounds; particular consideration was given to studies of the influence of certain must components on development of bouquet compounds during fermentation and to studies of the possibility of characterizing vine var. by means of aroma composition. The studies covered in the report are: procedures developed for concn. and separation of aroma components of grapes and wines (e.g. capillary chromatography); comparison of aromagrams of different grape var. (the aromagrams being obtained by capillary chromatography on glass columns); influence of grape maturity and growing location on aroma components; and characterization of different vine var. by contents of certain key substances. Results indicated that contents of volatile compounds may be successfully used for characterization. JA

105

The aroma of various teas. (In 'Flavor of foods and beverages' [see FSTA (1980) 12 6A363]) [Lecture] Yamanishi, T.

pp. 305-328 (1978) [83 ref. En] [Dep. of Food & Nutr., Ochanomizu Univ., Bunkyo-ku, Tokyo, Japan]

The paper commences with a list of aroma

compounds found in tea in previous studies, and includes 26 hydrocarbons, 42 alcohols, 49 aldehydes, 41 ketones, 38 esters, 15 lactones, 25 acids, 13 phenols, 13 miscellaneous oxygenated compounds, 4 S compounds, and 32 nitrogenous compounds; the year in which each compound was first reported in tea is included in the list. Brief consideration is then given to the manufacturing processes for black, green (sen-cha) and pouchong teas. Studies on the aroma of various types of tea are reported, and the aroma compounds found (and, in some cases, their relative quantity) are listed. The teas studied were flavory Ceylon black, Keemun black, green (including spring green and roasted green), pouchong, jasmine (pan-fired Chinese tea scented with jasmine flower), and lotus (pan-fired Vietnamese green tea scented with lotus pollen). Results indicated that the characteristic aroma of the teas studied was generally (except in the case of scented var.) determined by the balance between several aroma constituents. The 'top-note' of flavours was attributed to a relatively small proportion of the compounds isolated. JA

106

[Chromatographic profile of the volatile fraction of coffee. Difference between healthy and stinking raw coffee. Influence of roasting on the bean and beverage.]

Cros, E.; Guyot, B.; Vincent, J.-C.
Cafe-Cacao-The 23 (3) 193-202 (1979) [13 ref. Fr, de, en, es] [IFCC, Montpellier, France]

A method of concn. and analysis of trace volatile organics in gases and biological fluids [see *Chromatographia* (1973) 6, 67-70] and of S-compounds in coffee [see FSTA (1978) 10 10H1346] was used to evaluate coffee quality. It involved pre-concn. of the volatile fraction on Tenax GC, followed by GLC. The chromatographic profiles of the volatile fractions from healthy and stinking green coffee of the same origin (Arabica, Cameroon), and from light, medium and dark roasted coffee beans and liquor are shown graphically and in tables. Considerable qualitative and quantitative differences were observed between the profiles of healthy and stinking beans, allowing quick detection of 'stinkers'. A close relation was revealed between the volatile fraction of coffee beans and that of the coffee beverage. The composition of headspace volatiles was dependent on the degree of roasting, allowing its application as a quality index for roasted coffee. The analytical method is particularly useful for evaluating coffee during storage and for coffee with high moisture and low volatiles contents. RM

107

Volatiles retention during the dehydration of onion (*Allium cepa* L.).

Mazza, G.; Maguer, M. le
Lebensmittel-Wissenschaft und -Technologie 12 (6) 333-337 (1979) [25 ref. En] [Alberta Hort. Res. Cent., Brooks, Alberta, Canada]

Retention of volatiles during dehydration of onion was studied as a function of different process conditions. Volatile components in the headspace were identified

and analysed by gas chromatography-MS, utilizing an on-column entrainment procedure. Measurement of dipropyl disulphide, 1-propanethiol and 1-propanol showed that these compounds were lost almost exclusively before the onion reached a critical moisture content, at which point the volatiles were locked in. Under the experimental conditions used, increasing the drying rate by increasing the temp. of the air promoted retention. The results, though difficult to interpret, provide some support for the selective diffusion theory of volatile retention, in the case of onion slices. AS

108

[Aroma components of heated liquid sugar.]

Ito, H.; Deki, M.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 25 (10) 549-555 (1978) [3 ref. Ja, en] [Tech. Dep. & Res. Lab., Japan Sugar Refiners' Ass., Chiyoda-ku, Tokyo, Japan]

Aroma components of 50% inverted liquid sugar heated at 120°C for (i) 10 min were compared by GLC-MS with those of samples heated for (ii) 30 min at the same temp. The (i) aroma consisted of a small number of compounds, including isomaltol and maltol, which gave better flavour than (ii). The (ii) flavour consisted of many compounds giving a 'burning' and 'stimulating' odour, and bitter taste. The above off-flavour compounds increased markedly with reduction of 5-hydroxymethylfurfural concn. Consequently, to produce acceptable liquid sugar, the heat treatment should be stopped when maltol compounds concn. is > 10 p.p.m. and relative content of 5-hydroxymethylfurfural is max. AS

109

[The flavour of bread.]

Richard-Molard, D.; Drapron, R.

Techniques des Industries Cerealieres No. 166, 3-8, 10-11 (1978) [8 ref. Fr, en] [INRA-Lab. de Biophysique des Aliments, Chemin de la Geraudiere, 44072 Nantes Cedex, France]

Aspects considered include: analysis of flavour compounds in bread (with special reference to GLC and MS); volatile constituents in bread; biogenesis of aroma compounds in bread; effects of kneading method; the importance of fermentation; effects of baking on the flavour of bread; effects of cooling; and changes in the flavour of bread as a result of staling. AJDW

110

Aroma analysis of virgin olive oil by head space (volatiles) and extraction (polyphenols) techniques. (In 'Flavor of foods and beverages' [see FSTA (1980) 12 6A363]) [Lecture]

Montedoro, G.; Bertuccioli, M.; Anichini, G.
pp. 247-281 (1978) [52 ref. En] [Istituto Ind. Agrarie, Univ. Studi di Perugia, Italy]

Details are given of extensive studies, both published and unpublished, of the volatile and polyphenolic constituents of olive oil. Procedures developed for the isolation and identification of these constituents are

outlined; the procedure for volatiles involves enrichment of headspace vapours on a porous polymer (Tenax GC) and quantitative analysis by GLC-MS, while the procedure for polyphenols involves extraction with methanol-water and quantitative evaluation by TLC and calorimetry. These techniques were used to study changes in the contents of volatiles and polyphenols during ripening, their contents in different cvs., effect of climate on the volatiles and polyphenols; mechanisms of formation of volatiles and polyphenols; and the effect of oil production processes (extraction, storage) on volatiles and phenols. Brief consideration is given to the organoleptic importance of the volatiles and phenols. The paper contains, in tables and graphs, extensive data obtained in the various studies. JA

111

The effect of heat treatment on the liberation of volatile sulfide from whey and cream.

Wahba, A.

Alexandria Journal of Agricultural Research 26 (3) 659-662 (1978) [11 ref. En, ar] [Dep. of Agric. Ind., Fac. of Agric., Univ. of Alexandria, Alexandria, Egypt]

Liberation of volatile sulphides, and their partition between the fat globule membrane proteins and the whey proteins of cows' and buffaloes' milk, was investigated in whey heated to 65-90°C for up to 60 min. The critical temp. for the first liberation of H₂S was 70°C, and the H₂S in whey increased gradually with heating. Momentary heating of cows' whey at 70°, 75°, 80°, 85° and 90°C gave average H₂S contents of 10, 16, 33, 76 and 180 µg/l, resp. Buffaloes' whey H₂S values were always less than for cows' whey. Washed cream, standardized to 35% fat, was heated to between 60° and 85°C for up to 45 min. No H₂S was liberated at <65°C. Increased temp. and holding times caused liberation of more sulphide; momentary heating of cows' cream to 65°, 70°, 75°, 80° and 85°C released H₂S at 10, 23, 31, 51 and 70 µg/l resp. JRR

112

New developments in meat aroma research. (In 'Flavor of foods and beverages' [see FSTA (1980) 12 6A363]) [Lecture]

Flament, L.; Willhalm, B.; Ohloff, G.

pp. 15-32 (1978) [61 ref. En] [Firmenich SA, Res. Lab., Geneva, Switzerland]

2 types of meat extract (prepared from raw meat and a commercial beef extract and representing, resp., meat roasted at 150-160°C and meat cooked in an aqueous medium 100°C) were analysed to identify their characteristic aroma components. The extract preparation, fractionation and analysis procedures are detailed. For raw meat they included extraction (by centrifugation, ultrafiltration and freeze-drying) of flavour precursors from an aqueous slurry of a defatted powder prepared from raw meat, and thermolysis of these water-soluble flavour precursors in vacuum at 160°C. The commercial beef extract was subjected to steam distillation and solvent extraction followed by distillation. Both extracts were found to contain several hundred components, most of which are common to both. The isolation and identification of some of these

components are detailed: from raw meat, cyclohexenones, lactyl lactates, lactones, 5-membered N-containing heterocycles and condensed 6-membered bicyclic N-containing heterocycles; from commercial beef extract, S-containing cyclic compounds, 4,5-dimethyl-4-cyclopentene-1,3-dione, hydantoins and 4-acetyl-2-methylpyrimidine. The paper concludes with some general remarks on the technical possibilities of and present trends in aroma analysis and on presentation of analytical results. JA

113

Monocarbonyl compounds in boiled beef flavour. Comparison of standardless gas chromatographic identification and combined gas chromatography-mass spectrometry.

Uralets, V. P.; Golovnja[Golovnya], R. V.

Nahrung 24 (2) 155-162 (1980) [21 ref. En, de, ru] [Inst. of Primary Organic Compounds, Moscow, USSR]

Volatile carbonyl compounds were isolated from boiled beef by steam distillation, and isolated as dinitrophenylhydrazones. They were identified either by standardless GLC as the free carbonyl compounds, or by GLC-MS as dinitrophenylhydrazone derivatives. Standardless GLC was on 4 columns differing in polarity (Apiezon-M, Triton X-305, Carbowax 100, 1,2,3-tris(cyanethoxy)propane), using flame ionization detection. Retention indices were calculated using n-alkanals as reference substances. Altogether, 41 carbonyl compounds were identified, including 16 alkanals, 5 alkenals and 19 ketones, and furfural. Results determined by GLC-MS and by the standardless GLC technique agreed well, confirming the effectiveness of the latter technique. IN

114

Sulfur containing compounds in the volatile constituents of boiled meat.

Golovnja[Golovnya], R. V.; Rothe, M.

Nahrung 24 (2) 141-154 (1980) [23 ref. En, de, ru] [Inst. of Primary Organic Compounds, Moscow, USSR]

S compounds present in the volatiles of boiled beef were precipitated with HgCl₂; after regeneration with HCl + potassium oxalate, they were determined by GLC on 4 columns of different polarity (Apiezon-M, OV-17, Triton X-305, PEG-1000), using flame photometric and flame ionization detection. 32 compounds were identified, including 6 mercaptans, 8 polysulphides, 4 sulphides and 8 heterocyclic S compounds. An artificial meat-like flavour preparation prepared by Maillard reaction of cysteine and 3 other amino acids with xylose showed a considerably different range of volatile S compounds to beef; of 21 S compounds isolated, 10 were identical to compounds in beef flavour volatiles. IN

115

[Interaction between flavouring substances and food components. III. Influence of dissolution medium on flavour instability of citral.] Wechselwirkungen zwischen Aromastoffen und Lebensmitteln. III. Der Einfluss der Solvationshülle auf die Aroma-Instabilität von Citral.

Friedrich, H.; Gubler, B. A.

Lebensmittel-Wissenschaft und -Technologie 12 (5) 281-283 (1979) [2 ref. De, en] [Givaudan SA, CH-8600 Dübendorf, Switzerland]

The flavouring substance citral, important for lemon flavour, is rather unstable in foods. To incorporate a lemon flavour into a food, cold pressed lemon peel oil, containing 2-4% citral is used traditionally. It was shown that citral, when part of lemon oil, is considerably more stable in a food model than isolated citral. Investigation into the components of lemon oil responsible for this stabilization showed that monoterpene hydrocarbon D-limonene showed a stabilizing effect for citral similar to that of the total lemon oil. Application of these findings to food formulation is limited, as D-limonene is soluble in water-containing foods only to a very limited extent. D-Limonene is also very susceptible to oxidation, and forms malodorous degradation products. Maltodextrin solution and a casein suspension were used as food models. [See FSTA (1979) 11 11H1968 for part II.] AS

116

An alternative model of olfactory quantitative interaction in binary mixtures.

Patte, F.; Laffort, P.

Chemical Senses and Flavour 4 (4) 267-274 (1979) [18 ref. En] [Physiologie de la Chimioréception, CNRS, F91190 Gif-sur-Yvette, France]

An alternative model to the 'vectorial' model proposed by Berglund et al. [See *Journal of Experimental Psychology* (1973) 100, 29-38] is described. The alternative model, called the 'U model', is based upon perceived odorous intensity of a mixture as a function of perceived odorous intensity of the components. Comparison of the 'U model' with the 'vectorial model', showed the 'U model' to give correlation coeff. slightly better or equal to those obtained with the 'vectorial model', and smaller s.d. in calculating $\cos \alpha$. It is concluded that these 2 methods require testing with a greater number of experimental data. SP

117

A convenient synthesis of (E,E,Z)-2,4,7-decatrienal. Seifert, R. M.; Buttery, R. G.

Journal of Agricultural and Food Chemistry 28 (1) 68-70 (1980) [10 ref. En] [W. Reg. Res. Cent., Sci. & Education Administration, USDA, Berkeley, California 94710, USA]

A convenient synthesis of the title compound, starting from (Z)-hex-3-enol, is reported. The compound has been reported as present in oxidized linolenic acid, and was required to confirm the identity of a decatrienal resulting from lipid oxidation in foods. Odour threshold of the synthesized compound in water was 0.93 parts/billion (95% confidence limits 0.80-1.08 parts/billion), and odour in water at 1 p.p.m. was described primarily as 'cucumber' but also as 'green-grassy' and 'oily' by a 41-member panel. Chemical and physical properties of the synthesized compound are fully described. DIH

118

[Apparatus for continuous extraction of aroma compounds using liquid gas.] Apparatur zur kontinuierlichen Extraktion von Aromastoffen mit verflüssigten Gasen.

Koller, W.-D.

Lebensmittel-Wissenschaft und -Technologie 13 (1) 49-50 (1980) [De, en] [Inst. für Lebensmittelchem., Bundesforschungsanstalt für Ernährung, D-7500 Karlsruhe 1, Federal Republic of Germany]

An apparatus is described allowing constituents to be extracted from aqueous solutions by means of liquefied gas. It is necessary, however, that the liquid gas be insoluble in water and that its density be lower than that of the aqueous solution. Using the apparatus described, practically solvent-free extracts may be obtained at room temp. Extraction of 4 test substances from an aqueous solution using 1,1-difluoroethane (b.p. -24.7°C) is described as an example. AS

119

[Modified gas chromatographic method for analysis of volatile components of beer.]

Danilovtseva, A. B.; Kadaner, Ya. D.; Kalunyants, K. A. *Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya* No. 2, 122-126 (1979) [12 ref. Ru] [Moskovskii Ordena Trudovogo Krasnogo Znameni Tekh. Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

The newly developed method allows rapid and accurate detn. of basic volatiles responsible for beer flavour. The gaseous phase of Zhigulevsk beer contained atmospheric O₂, 2,3-butanedione (diacetyl), and 2,3-pentadione which were determined using 2,3-hexadione as internal standard. Other volatiles included acetaldehyde, acetone, methyl formate, ethyl acetate, ethanol, n-propanol, isobutanol, n-butanol, isoamyl acetate, isoamyl alcohol, and amyl alcohol. The special new apparatus was developed for preparation of samples for beer analysis. STI

120

Occurrence and formation of damascenone, trans-2,6,6-trimethyl-1-crotonyl-cyclohexa-1,3-diene, in alcoholic beverages.

Masuda, M.; Nishimura, K.

Journal of Food Science 45 (2) 396-397 (1980) [En] [Cent. Res. Inst. of Suntory Ltd., Wakayamadai-1, Shimamoto-Cho, Mishima-Gun, Osaka, Japan]

The aroma compound, damascenone, was found in many alcoholic beverages such as whiskey, brandy, rum, wine, and beer, and was considered to be significant to flavour. Damascenone in whiskey was formed from its precursor that came from barley during distillation. Beer contained none or very little, but it was formed by heating. In brandy production damascenone was present in grape and wine together with its precursor, and the precursor changed to it during distillation. It was also found in cane molasses. IFT

121

Changes in polyphenols, amino acids and volatile compounds during fermentation and firing in orthodox processing of tea.

Wickremasinghe, R. L.; Ekanayake, A.; Rajasingham, C. C.; Jayanthi de Silva, M.
Journal of the National Science Council of Sri Lanka 7 (1) 5-9 (1979) [6 ref. En] [Tea Res. Inst. of Sri Lanka, Talawakelle, Sri Lanka]

In orthodox manufacture of tea, prolonging the fermentation results in reduced solubility of tea polyphenols due to increased binding to other cell components: between 30 min and 150 min fermentation, total polyphenols in dhools and black tea fell from 327 to 302 and from 350 to 293 mg/g DM resp., and vanillin-reacting polyphenols fell from 166 to 126 and from 170 to 130 mg/g resp. Fermentation time had no effect on total amino acid contents. On firing, the bound polyphenols and total amino acids increased and there was a considerable loss of volatile compounds (total amino acids in dhool and fired black tea were 13 and 20 mg/g DM resp; loss of volatile essential oils was 8-68%, irrespective of fermentation time). Recent unpublished work suggested improvement of black tea flavour by recovering the essential oils lost during firing. RM

122

Isoamyl acetate - a key fermentation volatile of wines of *Vitis vinifera* cv. Pinotage.

Wyk, C. J. van; Augustyn, O. P. H.; Wet, P. de; Joubert, W. A.

American Journal of Enology and Viticulture 30 (3) 167-173 (1979) [37 ref. En] [Dep. of Oenology, Univ. of Stellenbosch, Stellenbosch 7600, South Africa]

Young red table wines of the cv. Pinotage (Pinot noir × Cinsaut) have a distinctive fermentation bouquet. This bouquet is not present in either the Pinotage grapes or must but is known to be formed during fermentation. Isoamyl acetate, when present in relatively large concn. was shown to be the 'impact' compound responsible for this typical bouquet. Wines from other cv. to which isoamyl acetate had been added were classified as being typically Pinotage in the course of a red varietal wine evaluation. Examination of the results from 2 of the 1975 Wine Shows indicated that the presence of this bouquet is evidently considered to be a positive quality-enhancing factor. During ageing this bouquet gradually decreased in intensity and finally disappeared. This change was accompanied by a concurrent decrease in isoamyl acetate concn. A similar reduction in bouquet intensity and isoamyl acetate concn. was observed when the wine was exposed to an excess of O₂, as well as elevated temp. AS

123

Volatile aroma components of Australian port wines. Simpson, R. F.

Journal of the Science of Food and Agriculture 31 (2) 214-222 (1980) [35 ref. En] [Australian Wine Res. Inst., Glen Osmond, South Australia 5064, Australia]

The volatile aroma compositions of a blended Australian port wine, having an equivalent age of 20 yr, and a similar 100-yr-old port wine were examined by

gas chromatography and gas chromatography-MS. The compounds identified were products of yeast fermentation, acetalization, esterification and oxidation reactions occurring during storage, carbohydrate degradation (of residual grape sugar and wood hemicellulose) and wood extraction. High concn. of ethyl lactate, diethyl succinate and diethyl malate were found relative to quantities present in young wine. 1-Ethoxy-1-(3-methylbutoxy)ethane, 1-ethoxy-1-(2-methylbutoxy)ethane, 1,1-diethoxypropan-2-one, *cis*-5-hydroxy-2-methyl-1,3-dioxane and *cis*-4-hydroxymethyl-2-methyl-1,3-dioxolane were identified. The presence of these and other acetals demonstrated that carbonyl compounds were also present. Carbonyl compounds are likely to contribute to the 'rancio' flavour of these port wines. Carbohydrate-derived compounds found included furfural, 2-acetylfuran, 5-methylfurfural, ethyl laevulinate, ethyl furoate and 5-ethoxymethyl furfural. Oak lactone, which is a wood extractive, was also identified and is likely to contribute to the woody aroma distinguishable in these port wines. AS

124

[Method for primary extraction of ground coffee.] DEJ International Research Co. BV

Netherlands Patent Application 7 809 885 (1979) [Nl]

Extraction of ground coffee uses only a small amount of water, thus eliminating the concn. process after extraction. The aromatic hydrophobic components of the coffee are stripped from the extraction liquid in the form of a conc. aqueous solution. This method is far less expensive than freeze-drying, and provides a product of similar quality with a "fresh brew note". W&Co

125

Sensory, compositional, and volatile attributes of controlled atmosphere stored peaches.

Watada, A. E.; Anderson, R. E.; Aulenbach, B. B.

Journal of the American Society for Horticultural Science 104 (5) 626-629 (1979) [4 ref. En] [Hort. Crops Marketing Lab., AMRI, USDA, Beltsville, Maryland 20705, USA]

Sensory and compositional attributes including low b. p. flavour volatiles of peaches [*Prunus persica* (L.) Batsch cv. 'Redskin' and 'Rio Oso Gem'] stored in a controlled atmosphere were analysed. Intensities of fruitiness of 'Redskin' and acidity of both cv. decreased during the 9- and 15-wk storage periods. Intensities of bitterness, mustiness, and fermented attribute were low but were sufficient to affect desirability. Volatile and nonvolatile components accounted for some of the variation in sensory attributes. The amount of variation explained by components increased when volatile peak areas were converted to logarithms for the stepwise multiple regression analysis. AS

126

Chemistry of baked potato flavor. I. Pyrazines and thiazoles identified in the volatile flavor of baked potato.

Coleman, E. C.; Ho, C.-T.

Journal of Agricultural and Food Chemistry 28 (1) 66-68 (1980) [21 ref. En] [Dep. of Food Sci., Rutgers, State Univ. of New Jersey, New Brunswick, New

ersey 08903, USA]

The volatile flavour was isolated from 540 lb of Idaho Russet Burbank baked potatoes. Extensive gas chromatographic analysis yielded 420 fractions. The odour of each chromatographic fraction was evaluated, and the fractions were identified by IR and MS. 3 pyrazines and 3 thiazoles were identified. Results of this work indicate that natural baked potato flavour is not due to a single compound, but is the result of the mixture of a number of components. AS

127

Volatile flavor components of cooked Kaorimai (scented rice, *O. sativa japonica*).

Yajima, I.; Yanai, T.; Nakamura, M.; Sakakibara, H.; Hayashi, K.

Agricultural and Biological Chemistry 43 (12) 2425-2429 (1979) [4 ref. En] [Kawasaki Res. Lab., T. Hasegawa Co. Ltd., Kawasaki, Japan]

Headspace vapours containing the volatiles of cooked Kaorimai (scented rice, *Oryza sativa japonica*) were drawn off into cold traps under reduced pressure. The resulting condensate was extracted with ethyl ether and the extract was then separated into acidic, basic and neutral fractions. The neutral fraction was further separated into hydrocarbons and oxygenated compounds by silica gel column chromatography. All fractions were examined by GLC and GLC-MS; 114 compounds were identified. Among them was α -pyrrolidone which was identified for the first time as a volatile flavour compound of any cooked rice. The authors also made a comparison of volatile flavour compounds in cooked Koshihikari rice (*O. sativa japonica* var. Koshihikari) and Kaorimai. AS

128

Volatile components from trilinolein heated in air.

Selke, E.; Rohwedder, W. K.; Dutton, H. J.

Journal of the American Oil Chemists' Society 57 (1) 25-30 (1980) [36 ref. En] [N. Reg. Res. Cent., USDA, Peoria, Illinois 61604, USA]

Pure trilinolein and mixtures of trilinolein-tristearin, trilinolein-triolein, and trilinolein-triolein-tristearin were heated to 192°C in air. Volatiles were collected, separated, and identified by gas chromatography-MS. Major volatiles observed from each heated sample produced compounds unique to the autoxidation-decomposition of the trilinolein component and included: pentane, acrolein, pentanal, 1-pentanol, hexanal, 2- and/or 3-hexenal, 2-heptenal, 2-octenal, 2,4-decadienal, and 4,5-epoxydec-2-enal. When samples containing both trilinolein and triolein were heated, volatiles were produced that could be ascribed to each triglyceride. However, heated mixtures containing tristearin produced no observable volatiles that could be related to the oxidized saturated triglyceride. Minor volatiles identified from the heated trilinolein and its mixtures included: aliphatic acids, saturated and unsaturated aldehydes, primary and secondary alcohols, γ lactones, furans, hydrocarbons, and methyl ketones. AS

129

[Current problems of meat flavour research.] Zu aktuellen Problemen der Fleischaromaforschung. Rödel, W.; Kruse, H.-P.

Nahrung 24 (2) 129-139 (1980) [22 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

Problems with analysis of the flavour of meat are discussed; with reference to: preparation of aroma concentrates; the relative instability of meat flavour compounds; and isolation and sensory characterization of flavour compounds. It is suggested that the flavour of meat may be attributed to complex interaction of numerous constituents, rather than to a few key substances. Studies on high-purity synthetic samples of compounds claimed in the literature to be specific meat flavour compounds (e.g. thiophenecarboxaldehyde, 5-thiomethylfurfural and 3,5-dimethyl-1,2,4-trithiolane) showed that these compounds failed to confirm the claimed flavour characteristics of these compounds. IN

130

Comparison of batchwise and continuous steam distillation-solvent extraction recovery of volatiles from oleoresin capsicum, African type (*Capsicum frutescens*).

Teranishi, R.; Keller, U.; Flath, R. A.; Mon, T. R.

Journal of Agricultural and Food Chemistry 28 (1) 156-157 (1980) [9 ref. En] [W. Reg. Res. Cent., Sci. & Education Administration, USDA, Berkeley, California 94710, USA]

Batchwise and continuous steam distillation/liquid-liquid extraction methods were used to recover volatiles from the oleoresin of capsicum, African type (*Capsicum frutescens*). In the continuous system, with the oleoresin pot temp. maintained at approx. 225°C, a higher yield of volatile material was obtained than with the pot at approx. 150°C. Increased yield at higher temp. was due largely to higher yields of free acids, predominantly acetic acid, and methyl esters of lauric, palmitic, and stearic acids - compounds which are not distilled over in appreciable quantities with the batch steam distillation system. With the oleoresin pot at the lower temp., the mixture of volatiles obtained was similar in composition to that obtained in the batch method. AS

131

Microbore columns in liquid chromatography.

Scott, R. P. W.

Journal of Chromatographic Science 18 (2) 49-54 (1980) [8 ref. En] [Chem. Res. Dep., Hoffmann-La Roche Inc., Nutley, New Jersey 07110, USA]

Advantages of microbore columns are discussed and their capability of providing high efficiency, high speed, and high mass sensitivity separations is outlined. Apparatus necessary for use with microbore columns is described, together with packing procedures and optimum operating parameters. Examples of use of microbore columns to provide separations of bergamot oil and other biological samples are included. AS

132

Pungency: the stimuli and their evaluation. [Lecture] Govindarajan, V. S.

ACS Symposium Series 115, 53-92 (1979) [57 ref. En] [Cent. Food Tech. Res. Inst., Mysore 570013, India]

This review begins by appraising the term pungency, and defines it as the gustatory sensory response to specific chemical stimuli found in certain spices and vegetables. Consideration is then given to problems associated with the evaluation of pungency and to standardized procedures for evaluation which yield reproducible data significantly correlated with instrumental estimates of the corresponding stimuli. Details are then given of the pungent compounds found in chillies (*Capsicum* spp.), pepper (*Piper nigrum*) and ginger (*Zingiber officinale*), consideration being given to the chemistry of the specific pungency stimuli in these 3 spices, the methods chosen for the physico-chemical detn. of these stimuli and the correlation of such physico-chemical values with pungency. Brief mention is also made of pungent compounds found in other spices (e.g. mustard, cloves) and in vegetables (e.g. horseradish, vegetable radish, *Brassica* and *Allium* spp.). The review concludes with a discussion of attempts to establish a relationship between specific structural features of the stimuli and the chemoreceptor perception of pungency. [See FSTA (1980) 12 8A540.] JA

133

[Gas chromatographic characterization of cognac, armagnac and other brandies. I. Analytical methods.] Gaschromatographische Charakterisierung von Weinbrand, Cognac und Armagnac.

I. Untersuchungsmethodik.

Postel, W.; Adam, L.

Branntweinwirtschaft 119 (24) 404-409 (1979) [46 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

A procedure for identification of volatiles in brandies is described, based on separation of the volatile fraction by distillation, and GLC of the distillate on a series of columns (Carbowax 400, FFAP, Igepal, Ucon, triethanolamine). Peaks are identified on the basis of retention times, by means of standards, and by MS. Lists are given of the GLC conditions, and the volatile constituents which may be identified using each of these columns. Accuracy and reproducibility of the method are good. 53 volatile compounds may be determined, including 9 carbonyl compounds, 17 alcohols, 3 terpenes and 24 esters. AJDW

134

[Aroma compounds of William pear and apple brandies.] Aromastoffe in Williamsbirnen- und Apfelbranntweinen.

Pfannhauser, W.; Eberhardt, R.

Alkohol-Industrie 92 (5) 104, 107 (1979) [5 ref. De] [Forschungsinst. der Ernährungswirtschaft, Blaasstrasse 29, A-1190 Vienna, Austria]

See FSTA (1979) 11 11111908 and 11111909.

135

[The volatile fraction of orange juice. II. Head space analysis.]

Alberola, J.; Izquierdo, L.

Revista de Agroquímica y Tecnología de Alimentos 19 (3) 327-337 (1979) [many ref. Es, en] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

Techniques of head space analysis are reviewed with special reference to the volatile fraction of orange juice. Analysis may be done either by direct injection of known vol. of air into a gas chromatograph, or by prior concn. of volatiles by cryogenic trapping or adsorption on porous organic polymers. [From En summ.] [See FSTA (1980) 12 6H899 for part I.] RM

136

[Evaluation of quality of fruit varieties using grapes as an example.] Sorten- bzw. Qualitätsbeurteilung am Beispiel der Traubenhaltstoffe. [Lecture]

Rapp, A.; Hastrich, H.; Engel, L.; Knipser, W.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 39-63 (1978) [31 ref. De, en, fr] [BFA für Rebenzüchtung Geilweilerhof, Siebeldingen, Federal Republic of Germany]

Grape juices from different var. can be separated by their aroma composition. Components vary in threshold values from 10^{-4} to 10^{-11} g/l and in taste sensation; those present in minute concn. may be of greater qualitative significance than those present in relatively large concn. Analysis of components present in small concn. requires an enrichment procedure (liquid-liquid extraction at very low temp. or adsorption from headspace vapour on to a solid medium); Freon 11 was very successful for alcohols and esters. Separation of aroma concentrates then requires very high efficiency columns, e.g. glass capillary. During a 3 h analysis period of aroma concentrates from grape juices and homogenates, about 400 peaks were obtained, which provided ample scope for characterization. Marked differences in aroma composition (fingerprint patterns) were found between var., and within these general var. patterns further differences in the quantities of specific 'key substances' permitted recognition of individual var. types independently of the origin or maturity of the sample. Examples of 'aromagrams' are presented. [See FSTA (1980) 12 8H1208.] ELC

137

Influence of gas volume sampled on wine headspace analysis using preconcentration on Chromosorb 103 Simpson, R. F.

Chromatographia 12 (11) 733-736 (1979) [14 ref. En] [Australian Wine Res. Inst., Glen Osmond, S. Australia 5064, Australia]

Examination was made of the changes in composition of aroma volatiles trapped on Chromosorb 105 during dynamic headspace sampling of aged wine (1961). 6 different 150 cm³ samples of bulked wine with 6 different vol. of sweep gas, i.e. 5, 10, 15, 20, 25 and 30 l N₂, at 30 cm³/min, were collected and analysed. Tabulated results showed that analyses of headspace collections containing reduced quantities of the

volatile and more hydrophobic compounds could aid in the identification and quantitative detn. of alcoholic beverage composition: compositions calculated by extrapolation to zero vol. sampled should approximate to air-liquid equilibrium composition for the original wine. RM

138

[Influence of HTST treatment and desulphurizing processes on flavour compounds.] Verhalten der Aromastoffe bei der Haltbarmachung nach dem Hochkurzzeiterrhitzungs- und Entschwefelungsverfahren. [Lecture] Wucherpfennig, K.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 249-270 (1978) [19 ref. De, en, fr] [Inst. für Weinchem. & Getränkeforschung der Forschungsanstalt für Weinbau, Gartenbau, Geisenheim, Federal Republic of Germany]

An EEC directive of 1975 permits the use of sulphurizing and desulphurizing processes in addition to HTST treatment for protecting fruit juices and similar products from microbiological changes. 1500-2000 mg/l of H_2SO_3 are added and subsequently withdrawn from the juice before bottling by partial concn. of the juice by evaporation or by passing inert gas through the juice (diagram of process given). Studies using grape must showed that 150-25 mg/l of H_2SO_3 remained in the desulphurized must, with no change in the content of total acids or the sp. gr.; hydroxymethylfurfural resulting from Maillard reactions during heat treatment was present in traces only. Sulphurization increased the K_2SO_4 content by 500 mg/l but sulphate content was not increased by desulphurization. The aroma contents of sulphurized and desulphurized grape musts were determined to check possible losses of aroma compounds with the withdrawn SO_2 gas. Results of gas chromatography (tabulated) showed differences in quantitative but not in qualitative aroma composition. The content of low b.p. aroma compounds decreased during desulphurization but smell and taste of desulphurized juices was considered to be more pleasant. [See FSTA (1980) 12 8H1208.] ELC

139

Flavour impact values: a new concept for assigning numerical values for the potency of individual flavour components and their contribution to the overall flavour profile. [Lecture]

Casimir, D. J.; Whitfield, F. B.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 325-347 (1978) [13 ref. En, fr, de] [Food Res. Lab., CSIRO Div. of Food Research, North Ryde, NSW 2113, Australia]

The juice of purple passionfruit (*Passiflora edulis* Sims) was used to illustrate a procedure for the selection and identification of flavour components contributing to the flavour profile of the juice. A new parameter, Flavour Impact Value (FIV), was determined for individual compounds important to the flavour profile by relating psychophysical flavour response of a sensory panel to an incremental increase in concn. of the compound. The FIV's of individual components and

their concn. in the juice were used to determine the contribution of each component to the overall passionfruit flavour profile. Similarly the quality of the flavour profile can be determined for passionfruit juice concentrates, essence fractions and combinations of these. The validity of the procedure was supported by taste panel evaluations of a passionfruit drink made from a synthetic essence compounded to simulate the natural flavour profile. [See FSTA (1980) 12 8H1208.] AS

140

[Flavour evaluation of apricot nectar using sensory and gas chromatographic methods.]

Aromabeurteilung von Aprikosennektar mit sensorischen und gaschromatographischen Methoden. [Lecture]

Sule, D.; Juhas, E.; Vujicic, B.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 173-182 (1978) [6 ref. De, en, fr] [Tech. Fac. der Univ., Novi Sad, Yugoslavia]

Flavour assessments of apricot nectars in Yugoslavia were made by sensory methods (organoleptic scoring system given) and from analyses by gas chromatography (technique given) with resulting aromagrams and the aroma concn. from planimetric areas. Results of organoleptic scores vs. analyses are tabulated and show very good correlation. Correlation coeff. (r) between analytical results and sensory evaluations were: general aroma 0.953, specific aroma note 0.917, agreement with national standard 0.815 and overall quality 0.854. A regression line is also given. Chromatographic flavour analysis cannot be applied if formation of undesirable secondary volatile components has occurred. [See FSTA (1980) 12 8H1208.] ELC

141

A recent development in essence recovery. [Lecture] Hasting, A. P. M.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 125-140 (1978) [12 ref. En, fr, de] [Process Dev. Dep., APV International Ltd., Crawley, Sussex, UK]

During the past 2 yr an essence recovery system initially developed for use in the citrus industry has been shown to work equally well in the recovery of apple, pear and berry juice essences. The system developed was of the partial condensation type and GLC analyses carried out in conjunction with sensory evaluations showed it to be capable of producing a satisfactory, commercially acceptable product. The simplicity of design has resulted in a low capital and running cost unit, which is easy to control and flexible in operation. In particular the production of apple juice essences has been studied, together with the effects of depectinisation on essence quality, and a method proposed, which is felt to give the best compromise between capital and running costs. [See FSTA (1980) 12 8H1208.] AS

142

[Primary and secondary flavour compounds and their analysis.] Primär- und Sekundäraromastoffe sowie deren Analytik. [Lecture]
Drawert, F.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 1-24 (1978) [23 ref. De, en, fr] [Inst. für Lebensmitteltech. & Analytische Chemie, Univ. München, Freising-Weihenstephan, Federal Republic of Germany]

Distinction is made between primary (natural) flavour compounds from undamaged vegetable tissue and secondary (technology influenced) flavours. The formation in apples, grapes, bananas and cucumbers of hexanal, *trans*-2-hexen-1-al, *trans*-2-nonen-1-al, 2-*trans*,6-*cis*-nonadien-1-al, 9-oxo-nonanoic acid and 10-*trans*-12-oxo-dodecenoic acid according to var. and maturity is recorded. Various secondary flavours are produced by enzymic cleavage of linoleic and linolenic acids. A pilot plant is described (with a diagram) for production of juice and blocking the fruit enzymes, so that formation of cleavage products is largely stopped and reaction mechanisms can be studied. Primary orange flavour compounds were identified by silica gel fractionation and it was demonstrated that various flavour compounds pass to the juice in very small amounts only. 80 flavour compounds were identified in tomato juice and formation of secondary compounds could be much reduced by HTST treatment on the pulp, and similarly in redcurrants. It was possible to separate various vine spp. by quantitative determinations of terpene alcohols, linalool oxide, nerol oxide and rosen oxide in the wines, although these compounds were present in low concn. only with low sensory thresholds. [See FSTA (1980) 12 8H1208.] ELC

143

[Influence of roasting on the composition of coffee.] Rösteffekte auf die Kaffeezusammensetzung. (In '8th International Scientific Colloquium on Coffee' [see FSTA (1980) 12 8H1257]) [Lecture]
Baltes, W.

pp. 85-96 (1979) [57 ref. De, en, fr] [Tech. Univ., Berlin]

As in most foods, the aroma of coffee is formed by special heating of the raw product. During this process a great many different reactions take place which are closely connected to one another by the high reactivity of the arising reaction products. Most important among them are the non-enzymic browning reaction (Maillard reaction) and degradation of amino acids (Strecker degradation). On the other hand, pyrolytic fragmentation rises with roasting temp. Besides representation of reaction types mentioned, a review of the effect of heat stability and of pyrolytic fragmentation product on roast coffee aroma is given.
AS

144

[Comparison of the aromatic substances of Arabusta, Arabica, and Robusta coffee beans by the 'headspace technique'.] Vergleich der Headspace-Aromaprofile von Arabusta-Kaffee mit Arabica- und Robusta-Sorten.

(In '8th International Scientific Colloquium on Coffee' [see FSTA (1980) 12 8H1257]) [Lecture]

Gutmann, W.; Werkhoff, P.; Barthels, M.; Vitzthum, O. G.

pp. 153-161 (1979) [14 ref. De, fr, en] Hag AG, Bremen, Federal Republic of Germany]

The various aromatic substances were compared in the green and roasted beans of Arabica, Arabusta and Robusta coffee by the so-called 'headspace technique' (the aromatic substances present in the headspace over a sample at ambient temp. being absorbed on active carbon or organic polymers, such as Tenax or Poropak and then analysed in a highly sensitive gas chromatograph). In the roasted beans of Arabusta and Arabica, the furan compounds were found to be predominant, while Robusta beans contained more S compounds than those of the other two. When the composition of the green beans was analysed, it was found that Arabusta beans were especially rich in 2-methoxy-3-isobutylpyrazine, whereas Arabica beans contained higher amount of isoamylalcohol. The quantitative comparison of the various groups of volatile compounds (aromatic substances, such as xylol, alkylbenzenes and naphthalene, as well as terpene, furan and pyrazine) present in the green beans showed terpene predominant in Arabica, while in contrast to roasted beans, furan occurred only in small quantity. A list of 80 newly described volatile substances present in green coffee beans is given. ESK

145

Brown oil extractor. A new commercial method for the production of citrus essential oils in Florida. Kesterson, J. W.; Braddock, R. J.; Crandall, P. G. *Perfumer & Flavorist* 4 (4) 9-10 (1979) [6 ref. En] [Univ. of Florida, Inst. of Food & Agric. Sci., Agric. Res. & Education Cent., Lake Alfred, Florida, USA]

The Brown oil extractor (BOE) which has replaced some Brown peel shaver, screw press and FMC citrus juice extractor installations is briefly described. Oil extraction is done on the whole fruit, before juice production, thus avoiding oil losses during juice extraction and ensuring max. oil recovery. Oil is recovered as an emulsion by causing citrus fruits to spin in the bight or trough between 2 parallel rolls formed by axially spaced metal discs with pointed teeth. The rolls are covered with water, so that fruit are partly submerged during oil extraction. 35 commercial samples of orange oil (from 928 503 kg) and 15 grapefruit oils (48 081 kg) from processors using the BOE were analysed. Tabulated results showed that the orange oils met all the USP specifications except for evaporation residue (weighted average values < USP min. of 43 mg/3 ml for Hamlin and Valencia orange, > 43 for Pineapple orange oil), possibly inherent in the BOE method. Grapefruit oils met all the FOA specification except for sp. gr: all oils exceeded the 0.852, with mean weighted value of 0.854. This could be corrected by thorough de-waxing and blending. Both oils have excellent colour, flavour and aroma. The BOE requires low vol. of water for recovery (1.9 l/40.8 kg fruit, vs. 11.4-30 l/box for most commercial methods). Oil emulsions are extremely low in soluble and insoluble solids, allowing continuous recycling of the centrifuge ring dam water. RM

[Technological processes and quality of essential oils in the Italian citrus industry.] [Lecture]

Giacomo, A. di

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 141-154 (1978) [10 ref. Fr, en, de] [Stazione Sperimentale per l'Industria delle Essenze e dei Derivati dagli Agrumi, Reggio Calabria, Italy]

Changes in essential oil extraction from citrus fruits have greatly modified the physicochemical data recorded in the literature and still used in official standards. The traditional process (in Sicily) for lemon essence involved folding over of peel, compression (usually manual) and collection of expressed essence on sponges; preliminary treatment with lime was commonly used to distend the tissues and facilitate discharge of essence. A major recent innovation is the 'sfumatura' (SFA) process, in which sponges are replaced by powerful jets of circulating water and centrifugal separation of the essential oil; spent peel is pressed again and the extract is distilled (diagram given). Liming has been abandoned for lemons (liming increases extraction of non-volatiles and may produce undesirable terpene odours) but has been retained for oranges. The SFA process has been made continuous and has greatly improved both yield and quality of essential oils. Closed circuit water circulation greatly increases the citral content of lemon oils and has significant effects on the spectrophotometric index (SI). A 2nd process now used in parts of Italy, especially for oranges, is based on rasping the whole fruit ('pelatura' process, diagram given). Data given for lemon and orange oils include sp. gr., refractive index, optical rotation, evaporation residue, SI, contents of carbonyls and β -carotene for different extraction processes, with and without lime treatment. Relation of new data to present market requirements and standards e.g. colour, nomenclature of essence types are discussed. [See FSTA (1980) 12 8H1208.] ELC

147

[Biosynthesis of apple volatiles: comparison of behaviour of different apple varieties.] [Lecture]

Paillard, N.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 25-38 (1978) [11 ref. Fr, en, de] [Physiologie Veg.

Appliquee, Univ. Pierre et Marie Curie, Paris, France]

Biosynthesis of volatiles was studied by adding known precursors to apple tissue, ageing under controlled conditions (described) and detn. by gas chromatography of the increased concn. of volatiles vs. a control. Thus it was shown that alcohols are formed from the aliphatic acids with the same number of C atoms (e.g. butanol from butyrate) and from long chain fatty acids (C6 to C14) after β -oxidation. Esters are synthesised in important quantities from the alcohols and acids, although this may be changed to hydrolysis by dead tissue, cellular remains or enzyme action. In yellow var. (e.g. Golden Delicious, Calville) the esters are almost entirely acetic (ethyl acetate), but are largely ethyl butyrate in red var. (Richared, Starking). The rates of transformation of butyrate into acetate and of

formation of fatty acids are of significance to apple aroma. A different mechanism was demonstrated for a var. (pale Canada) having a 'corky' epidermis, leading to formation of ketones (2-pentanone and 2-heptanone) from short chain fatty acids. The branched chain iso-alcohols and their esters may also be formed partly from amino acids. Stage of maturity of the fruit is also a major factor. [See FSTA (1980) 12 8H1208.] ELC

148

[Formation of volatile compounds during production of prunes.] [Lecture]

Moutounet, M.

Report, International Federation of Fruit Juice Producers, Scientific-Technical Commission No. 15, 363-372 (1978) [16 ref. Fr, en, de] [Cent. de Recherches, INRA de Toulouse, Castanet Tolosan, France]

Prunes were produced by tunnel drying of plums with air re-circulation so that max. temp. did not exceed 72-74°C. Samples of plums and prunes were frozen in liquid N, ground, subjected to evaporation under vacuum and the condensed volatiles were extracted with Freon and studied by linked gas chromatography-MS. Chromatograms are presented and the major components are listed. The major volatile components of plums are C6 to C12 lactones, in particular γ -decalactone. In the prunes lactones are greatly reduced and new compounds appear (20 are listed) which are furan derivatives, volatile phenols and carotenoid degradation products; these changes are readily apparent from the flavour. The proportion of volatile constituents in prunes is determined mainly by the drying oven temp. [See FSTA (1980) 12 8H1208.] ELC

149

Identification of some volatile products from mildly oxidized pecan oil.

Horvat, R. J.; Senter, S. D.

Journal of the American Oil Chemists' Society 57 (3) 111 (1980) [10 ref. En] [Richard B. Russell Res. Cent., USDA, Athens, Georgia 30604, USA]

150

Flavour properties of some sulphur compounds isolated from cheeses.

Cuér, A.; Dauphin, G.; Kergomard, A.; Roger, S.; Dumont, J. P.; Adda, J.

Lebensmittel-Wissenschaft und -Technologie 12 (5) 258-261 (1979) [33 ref. En] [Lab. de Chimie Organique Biol., ERA du CNRS No. 392, BP 45, 63170 Aubiere, France]

Synthesis of the following S-compounds, possibly associated with cheese flavour, is described: (i) 3,4-dithiahexane, (ii) 2,3-dithiapentane, (iii) 2,4-dithiapentane, (iv) 2,3,4-trithiapentane, (v) 2,3,5-trithiahexane, (vi) *cis* and *trans* 3,5-dimethyl-1,2,4-trithiolane, (vii) S-methylthioformate, (viii) S-methylthioacetate, (ix) S-methylthiopropionate, (x) S-methylthiobutyrate, (xi) S-methylthio-3-methylbutyrate and (xii) S-methylthio-2-methylbutyrate. Olfactory properties of these compounds were tested by diluting them in liquid cheese prepared by mixing pasteurized unripened heavy cream, low heat dried milk

proteins and water (2:1:1 w/w). Odour thresholds were also determined. Spectral data and results of GLC analyses and olfactory tests showed that compounds (ii), (vi) and (vii) were not identical with any of the unidentified flavour compounds isolated from cheese. Judges rated (iv) and (ix) as having cheese flavours. Since cheese aroma results from a blend of aroma compounds, those such as (iii), (viii), (xi) and (xii) with aromas of garlic, cooking cauliflower, fruit and wild strawberry, resp., may also be important cheese flavour components. MEG

151

[Determination of thioethers in canned meat.]

[Lecture]

Marchenko, A. P.

Proceedings of the European Meeting of Meat Research Workers No. 24, L3:1-L3:6 (1978) [11 ref. Ru, de, en, fr] [Vses. Nauchno-issled. Inst. Myasnoi Promyshlennosti, Moscow, USSR]

An apparatus for flash evaporation and vaporization from a continuous thin heated film under vacuum of volatile flavour compounds and their trapping in suitable absorbents [see FSTA (1973) 5 8S1031] is described and diagrammatically illustrated. Canned (i) 'stewed beef' and (ii) 'stewed mutton' in lacquered cans stored for 6 months at about 15°C were examined for thioether contents using a mercuric chloride trap and GLC analysis. Mean values with ranges for methyl sulphide contents of 5 samples of (i) and 5 samples of (ii) were resp. 2.3 (1.4-2.8) and 11.3 (7.0-14.2) µg/kg. Ethyl sulphide was not detected. [See FSTA (1980) 12 8S1280.] SKK

152

[Effect of some technological factors on formation of aroma components in cured, cooked horse-meat products.] [Lecture]

Bol'shakov, A. S.; Bryanskaya, I. V.; Girgor'eva, I. Ya.; Dragina, V. V.; Zabashta, A. G.

Proceedings of the European Meeting of Meat Research Workers No. 24, K4:1-K4:6 (1978) [9 ref. Ru, de, en, fr] [Moskovskii Tekh. Inst. Myasnoi & Molochnoi Promyshlennosti, Moscow, USSR]

Samples of *longissimus dorsi* muscle taken from horse carcasses directly after slaughter or after chilling for 4 days at 2°C were cured by injection of brine (16% salt, 0.5% sucrose and 0.1% nitrite) and were then mechanically treated for 30 min in a drum revolving at 3.768 radians/s. Samples pickled in brine for ≤ 15 days to a salt content of about 3% served as control. Experimental and control samples were cooked in hermetically sealed vessels at 80 ± 1°C to attainment of 72°C in the centre. Contents of volatile carbonyl and S compounds were determined in all variants by TLC and GLC methods. It is concluded from tabulated and described results that accumulation of the volatile carbonyl and S compounds responsible for the taste and aroma of the cured and cooked products was connected with the rate of penetration and distribution of pickle components in the muscle tissue in relation to its structural changes; and that mechanical treatment combined with brine injection contributed to improvement of organoleptic quality of cured horse meat. [See FSTA (1980) 12 8S1280.] SKK

153

[Flavour and taste transfer in relation to structure] Aroma- und Geschmacksübertragung in Korrelation zum Strukturgefüge.

Kleinert, J.

Zucker- und Süßwarenwirtschaft 32 (12) 419-423 (1979) [De] [Lindt & Sprüngli AG, Kilchberg, Switzerland]

The significance of structure for the taste and flavour of foods is discussed, with special reference to chocolate and other confectionery. Aspects considered include: the effects of relative particle sizes of constituents, e.g. effects of particle size of sugar and cocoa solids on the sweetness and astringency of cocoa mass; effects of the particle size on flavour and taste of suspensions; effects of the crystal size of fats (with special reference to the need for tempering of products containing cocoa butter); the desirability of max. homogeneity of distribution of flavourings, etc. in the product; and advantages of liquid-phase mixing over solid-phase mixing. AJDW

154

Allyl hexanoate - determination by gas chromatography.

International Organization of the Flavour Industry *Food, Flavourings, Ingredients, Packaging and Processing* 1 (5) 17 (1980) [En] [8 Rue Charles-Humbert, 1205 Geneva, Switzerland]

A description is given of a method (Recommended method 15) for the detn. of allyl hexanoate in juices, confectionery, dairy products and desserts. Allyl hexanoate is isolated by steam distillation and the distillate is extracted with a mixture of diethyl ether and pentane (2:1). The extract is then concentrated and subjected to gas chromatography. The method is described under the headings: reagents, apparatus, procedure, and expression of results. VJG

155

Gas chromatographic and mass spectrometric properties of ethyl esters of dithiocarbamic acids of primary and secondary amines.

Blotny, G.; Kusmierz, J.; Malinski, E.; Szafranek, J. *Journal of Chromatography* 193 (1) 61-69 (1980) [20 ref. En] [Inst. of Inorganic Chem. & Tech., Tech. Univ., 80-952 Gdansk, Poland]

Analysis of amines is highly important in structural and biochemical investigations and in the study of food products and pollutants. A method has been devised for determining primary and secondary amines in the form of dithiocarbamic acid ethyl esters by high-resolution gas chromatography and MS. The dithiocarbamic acid ethyl ester derivatives of primary amines decompose by pyrolysis in the injection port of a chromatograph to isothiocyanates, whereas derivatives of secondary amines do not decompose. The mechanism of isothiocyanate formation from dithiocarbamic acid esters was established by identifying the pyrolysis products. This method permits simultaneous differentiation and detn. of primary and secondary amines. AS

156

Container-derived contamination of maple sirup with methyl methacrylate, toluene, and styrene as determined by headspace gas-liquid chromatography. Hollifield, H. C.; Breder, C. V.; Dennison, J. L.; Roach, J. A. G.; Adams, W. S.

Journal of the Association of Official Analytical Chemists 63 (2) 173-177 (1980) [19 ref. En] [Div. of Chem. & Physics, FDA, Washington, DC 20204, USA]

Samples of maple syrup and associated plastics packaging were examined for the presence of methyl methacrylate, toluene, and styrene by a head space gas chromatographic procedure. The volatile components common to the syrup and the plastics container were identified by GC-MS. The quantities of these contaminants in the syrup were determined at p.p.b. levels by the standard additions technique and repetitive headspace analysis. AS

157

A gas chromatographic method for the accurate determination of low concentrations of volatile sulphur compounds in alcoholic beverages.

Leppänen, O.; Denslow, J.; Ronkainen, P.
Journal of the Institute of Brewing 85 (6) 350-353 (1979) [16 ref. En] [Res. Lab. of State Alcohol Monopoly (Alko), Box 350, SF-00101 Helsinki 10, Finland]

By using a new sensitive method the contents of dimethyl sulphide, dimethyl disulphide and dimethyl trisulphide were determined in beers and wines, and the contents of these sulphides and diethyl sulphite measured in distilled beverages. Head-space volatiles are swept out from the beverage in a stream of N_2 and adsorbed in a tube containing porous polymer. The volatiles are desorbed directly onto the column of a gas chromatograph by connecting the tube to the column and sliding the free end of the tube into the hot injection block from the oven side. The S-sensitive flame photometric detector is used and peak areas and identifications are collected on cassette and processed by computer to give the content of volatile S compounds directly in $\mu\text{g/l}$ beverage. The detection limits are 2 $\mu\text{g/l}$ for dimethyl sulphide, 0.1 $\mu\text{g/l}$ for dimethyl disulphide and trisulphide, and 5 $\mu\text{g/l}$ for diethyl sulphite. Analysis time for each sample is 30 min and the coeff. of variation is 5%. AS

158

Determination of thiolacetates and some other volatile sulfur compounds in alcoholic beverages.

Leppanen, O. A.; Denslow, J.; Ronkainen, P. P.
Journal of Agricultural and Food Chemistry 28 (2) 359-362 (1980) [17 ref. En] [Res. Lab. of the State Alcohol Monopoly (Alko), Box 350, SF-00101 Helsinki 10, Finland]

Methyl and ethyl thiolacetates (S-methyl and S-ethyl esters of ethanethioic acid) were identified and determined for the first time in beers and wines. Average content of methyl thiolacetate was 17 $\mu\text{g/l}$ in Finnish medium strength beer and 25 $\mu\text{g/l}$ in Finnish strong beer. The respective average contents for white and red wines were 7 and 11 $\mu\text{g/l}$. In most samples, the concn. of ethyl thiolacetate was about 10% that of

methyl thiolacetate. The strong beers contained significantly more methyl and ethyl thiolacetates than the medium beers from the same brewery, but the content of methyl sulphide was not significantly different. Carbon disulphide was identified for the first time in wines, in concn. up to 10 $\mu\text{g/l}$. The contents of thiolacetates were quantified down to 1 $\mu\text{g/l}$ by adsorbing the head-space volatiles of samples on porous polymer. Because thiolacetates can be hydrolysed to give free thiols, these esters are a potential source of off-flavours in alcoholic beverages despite their own high sensory thresholds. AS

159

Wine headspace analysis. Reproducibility and application to varietal classification.

Noble, A. C.; Flath, R. A.; Forrey, R. R.
Journal of Agricultural and Food Chemistry 28 (2) 346-353 (1980) [32 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

Wine headspace (HS) volatiles were collected by displacement and analysed by gas chromatography (GC), GC-MS, and sensory evaluation of the split GC effluent. Over 77% of the peak areas quantified in triplicate had coeff. of variation < 0.10. Nineteen peaks were selected for principal component analysis (PCA) and stepwise discriminant analysis (SDA). The first principal component (PC 1), although accounting for only 38% of the variance, separated 10 of the 11 White Riesling wines (R) from the 9 Chardonnays (C) and 4 French Colombards (F). Weighted > 0.50 on PC 1 were 8 components, some of which had fruity, floral descriptions, consistent with the aroma of R. Weighted < -0.50 on PC 1 were 3 "fruity" esters, also consistent with the characteristic aromas of C and F. Interestingly, linalool, often thought to be important in R, was not weighted heavily on PC 1. By SDA, the 24 wines were sorted successfully into 3 varietal categories by discriminant functions using 5 components. AS

160

Pattern recognition analysis of gas chromatographic data. Geographic classification of wines of *Vitis vinifera* cv. Pinot Noir from France and the United States.

Kwan, W.-O.; Kowalski, B. R.
Journal of Agricultural and Food Chemistry 28 (2) 356-359 (1980) [16 ref. En] [Lab. for Chemometrics, Univ. of Washington, Seattle, Washington 98195, USA]

Organic compositions of 40 wines of *Vitis vinifera* cv. Pinot Noir from France and the USA were analysed by glass capillary gas chromatography. Classifications of these wines according to their geographic origins were achieved by applying pattern recognition techniques to the chemical data. Key components for the classifications were then identified by gas chromatography-MS. 2 neutral compounds, 1-hexanol and cyclohexane, were found to be most important for the classification of French and American Pinot Noirs, while *p*-hydroxybenzaldehyde and 2-phenylethanol were major components for distinguishing California Pinot Noirs from those produced in the Pacific Northwest region. AS

161

Relative volatilities of some onion flavour components.

Mazza, G.

Journal of Food Technology 15 (1) 35-41 (1980) [19 ref. En] [Alberta Hort. Res. Cent., Brooks, Alberta T0J 0J0, Canada]

Volatilities, relative to water, of some onion flavour components were determined from simple gas chromatographic measurements of air/water partition coeff. using dil. (5-500 p.p.m.) aqueous solutions. Values of relative volatility determined were: propanethiol 19.413, 2,5-dimethyl thiophene 4680, methyl propyl sulphide 4040, dimethyl disulphide 2032, dipropyl disulphide 975, allyl methyl sulphide 3488, diallyl sulphide 2453, diallyl disulphide 2331, ethanal 107, propanal 149, methanol 1.3, ethanol 2.8, 1-propanol 4.7 and 2-propanol 8.5. Results are discussed with reference to loss of flavour during dehydration of onions. Increasing volatility of aldehydes and alcohols with increasing C-chain length is commented on. DIH

162

Identification of campesteryl palmitate and sitosteryl palmitate in wheat flour.

Hsieh, C. C.; Watson, C. A.; McDonald, C. E.

Journal of Food Science 45 (3) 523-525 (1980) [En] [Dep. of Cereal Chem. & Tech., North Dakota State Univ., Fargo, N. Dakota 58105, USA]

This study shows that both campesteryl palmitate and sitosteryl palmitate are present in wheat flour. These 2 saturated sterol esters, which appeared as 1 spot by TLC, were identified as the palmitates of campesterol and sitosterol by GLC and IR studies. Campesteryl palmitate and sitosteryl palmitate were present in relative proportions of about 1:5 in wheat flour in amounts of 0.0043 and 0.021%, resp. IFT

163

Heterocyclic compounds found in cooked meats. [Review]

Shibamoto, T.

Journal of Agricultural and Food Chemistry 28 (2) 237-243 (1980) [54 ref. En] [Dep. of Environmental Toxicology, Univ. of California, Davis, California 95616, USA]

Heterocyclic compounds occurring in cooked meat products (boiled beef, canned beef, cooked chicken, canned beef stew, cooked pork liver, roast beef, cooked ovine fat, shallow-fried beef, ground beef, roasted lamb fat) are reviewed. The compounds reviewed include thiophenes, furans, pyrazines, thiazoles, thiazolines, pyrroles, cyclic polysulphides, oxazoles, oxazolines, and pyridines. The odours of these chemicals in relation to cooked meat flavours are discussed. AS

164

Substituted 4-methyl-1,3-dioxolanes: solvent interaction products in some commercial beef flavorings.

MacLeod, G.; Seyyedain-Ardebili, M.; MacLeod, A. J.

Journal of Agricultural and Food Chemistry 28 (2) 441-446 (1980) [14 ref. En] [Dep. of Food Sci. & Nutr.,

Queen Elizabeth Coll., Univ. of London, London W8 7AH, UK]

By use of a modified Likens & Nickerson extraction procedure followed by low-temp/high-vacuum distillation, representative samples of aroma volatiles were obtained from some commercial beef flavorings. Prefractionation of concentrates by preparative gas chromatography facilitated subsequent analysis by combined gas chromatography/MS. One fraction provided a number of similar mass spectra exhibiting intense characteristic peaks at m/e 87. It was considered that these could be 2-substituted-4-methyl-1,3-dioxolanes, but dioxolanes have not been reported as volatile components of meat. Selected 1,3-dioxolanes were synthesised and comparison of their mass spectra and GC retention times confirmed the identities of the unknown components of the simulated meat flavour isolate. Their origin may be explained by interaction of propane-1,2-diol, a commonly used solvent for commercial flavours, with carbonyl aroma components - interactions which can modify the flavour characteristics of the product. AS

165

Volatile components of fermented soya hydrolysate. II. Composition of the basic fraction.

Liardon, R.; Ledermann, S.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 170 (3) 208-213 (1980) [11 ref. En, de] [Res. Dep., Nestle Products Tech. Assistance Co. Ltd., PO Box 88, CH-1814 Tour-de-Peilz, Switzerland]

Soybeans mixed with non-roasted or roasted flour were submitted first to a solid fermentation with *Aspergillus oryzae*, then to an alcoholic fermentation with *Saccharomyces rouxii*, to prepare samples of fermented soy hydrolysate (FSH, soy sauce). Basic volatile components were isolated from the final products and from the intermediate fermented soy cakes (FSC), and determined qualitatively and quantitatively. Identified components consisted of alkylpyrazines, alkylpyridines, and various amides. Comparison of FSH and FSC composition revealed that most of the basic components were formed during the solid fermentation by metabolic activity of the mould, rather than by non-enzymic browning processes taking place during FSH maturation. Moreover, basic volatiles were found in smaller numbers and levels in FSH than in the corresponding FSC. [See FSTA (1979) 11 2T65 for part I.] AS

166

[Volatile constituents of the essential oil of Spanish organum. I. Hydrocarbons and light oxygenated compounds.]

Sendra, J. M.; Cugat, P.

Revista de Agroquímica y Tecnología de Alimentos 19 (1) 102-118 (1979) [16 ref. Es, en] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

The essential oil of Spanish organum (*Coriandrum capitatus* Rehb), fractionated by silica gel column chromatography and preparative GLC, was studied by GLC-MS. Results, shown graphically and in tables, revealed that 43 compounds were identified in the

hydrocarbon and light oxygenated compound fractions. 32 of these compounds were identified for the first time in this essential oil: 7 monoterpene hydrocarbons, 8 sesquiterpene hydrocarbons, 12 oxygenated monoterpenes and 5 aliphatic oxygenated compounds. Proposed structures are presented. RM

167

[National Meeting of the French Society of Expert Chemists. Marseille, 14-15 September 1979.]

[Conference proceedings]

France, Societe des Experts-Chimistes de France

Annales des Falsifications et de l'Expertise Chimique 72 (779) 493-511 (1979) [Fr]

Introductory addresses to the meeting given by the director of the host institute and by A. Gayte-Sorbier are published, as are summaries of papers presented, including those of the following titles. Developments and prospectives in HPLC, by A.-M. Siouffi (p. 503). Application of capillary gas chromatography to analysis of derivatized components of wine, by P. de Smedt, P. A. P. Liddle & B. Cresto (p. 504). Content of selenium in foods of animal origin by atomic absorption spectrometry with electrothermal atomization, by P. Hocquellet (p. 505). Relation between various constituents of wines and application to detection of chaptalization, by S. Brun, T. Durand, - Cassanas, J.-C. Cabanis & L. Bardet. Chromatographic and spectroscopic studies of sterols, particularly of seaweed, by J. Artaud, M.-C. Iatrides, C. Tisse, J.-P. Zahra & J. Estienne (p. 507). Determination of glycerol content in wines by liquid chromatography; comparison with other methods, by J.-P. Goiffon, A. Blachere, J.-P. Perez & E. Portal (p. 508). DIH

168

Optimization of process conditions during drying with regard to quality factors.

Thijssen, H. A. C.

Lebensmittel-Wissenschaft und -Technologie 12 (6) 308-317 (1979) [16 ref. En] [Dep. of Chem. Eng., Eindhoven Univ. of Tech., Eindhoven, Netherlands]

In this lecture, the author discusses methods for calculating the temp.-moisture history of drying particles, thermal degradation of heat-labile components and retention of volatile aroma components during drying of liquid foods. MEG

169

[Determination of volatile nitrosamines in foods of animal origin.] Beitrag zur Analytik flüchtiger Nitrosamine in tierischen Lebensmitteln.

Fritz, W.; Uhde, W.-J.

Nahrung 24 (4/5) 471-477 (1980) [18 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

A procedure for detn. of volatile N-nitrosamines in foods of animal origin is described. Nitrosamines are isolated from the food sample by vacuum distillation, and extracted from the distillate (acidified to pH 1 with H₂SO₄) by means of methylene chloride. The nitrosamines are then denitrosated (by HBr treatment)

to the corresponding amines; the amines are derivatized with 7-chloro-4-nitrobenzo-2-oxa-1,3-diazole. The resulting fluorescent amine derivatives are then separated by 2-dimensional TLC on silica gel G plates, using benzene/diethyl ether/toluene (7:2:1) and n-heptane/ethyl acetate/n-butanol (8:1:1) solvent systems. The amines are determined in situ on the TLC plate by fluorescence spectrophotometry (excitation at 360 nm, emission at 526 nm). Recovery of 4 nitrosamines from pork and fish ranged from 40 to 90%. Detection limit is 0.1 µg/kg. .IN

170

[Problems with evaluation of natural flavours.]

Probleme bei der Beurteilung von natürlichen Aromen.

[Review]

Tressl, R.

Lebensmittelchemie und Gerichtliche Chemie 34 (2) 47-53 (1980) [27 ref. De] [Lehrstuhl für Chem.-tech. Analyse, Tech. Univ. Berlin, 1000 Berlin 65]

Aspects discussed include: 'impact components' in the flavour and aroma of foods; developments in flavour and aroma research (extraction and concn. of aroma compounds, GLC analysis, characterization of individual compounds by MS, NMR and IR spectroscopy); biosynthesis of impact components (with special reference to raspberry flavour constituents); problems with flavour evaluation in foods which lack 'impact components'; formation of C6 and C9 components by enzymic-oxidative processes; and thermal reactions in aroma formation (e.g. in roasting of coffee). AJDW

171

[The significance of the Maillard reaction for aroma formation in foods.] Die Bedeutung der Maillardreaktion für die Aromabildung in

Lebensmitteln. [Review]

Baltes, W.

Lebensmittelchemie und Gerichtliche Chemie 34 (2) 39-47 (1980) [31 ref. De] [Inst. für Lebensmittelchem., Tech. Univ., 1000 Berlin 12]

The mechanisms of formation of flavour and aroma compounds by Maillard and Amadori reactions and Strecker degradation reactions are discussed, and the organoleptic properties of reaction products of various sugar/amino acid mixtures are considered. Formation of various classes of flavour compounds (aldehydes, pyrazines, O-containing heterocyclic compounds, dihydro-3-furanones, furans, pyrroles, sulphides, thiols, thiophenes, thiazoles, and oxazoles) is described. The potential for manufacture of food flavourings by means of the Maillard reaction is briefly considered, with special reference to legal and toxicological aspects. AJDW

172

Odorous substances from Actinomycetes.

Gerber, N. N.

Developments in Industrial Microbiology 20, 225-238 (1979) [many ref. En] [Waksman Inst. of Microbiol., Rutgers Univ., New Brunswick, New Jersey 08903, USA]

Some highly odorous metabolites of actinomycetes,

geosmin, 2-methylisoborneol (MIB) and 2-isopropyl-3-methoxypyrazine (MIP), were isolated and identified as odour pollutants in natural water and in some fish from such water, found to be unpalatable. Geosmin was reported to be a normal flavour component of beets, and responsible for musty off-flavour of dried beans. It has also been detected as an off-flavour in whisky. MIP was known as a flavour component of peas and potatoes, and has been held responsible for musty odours in some spoiled fish and in milk [Morgan et al., *Journal of Dairy Science* (1972) 55, 666]. RM

173

Hops extraction.

Distillers Co. (Carbon Dioxide) Ltd.
British Patent 1 557 123 (1979) [En]

An extraction process is described which employs liquid CO₂ for extracting essences (α -acids) in solution from hops; the CO₂ is then evaporated off from the extract solution. IFT

174

Analysis of volatile *N*-nitrosamines in alcoholic beverages.

Goff, E. U.; Fine, D. H.

Food and Cosmetics Toxicology 17 (6) 569-573 (1979) [24 ref. En] [New England Inst. for Life Sci., 125 Second Avenue, Waltham, Massachusetts 02154, USA]

A description is given of a simplified analytical technique for analysis of volatile *N*-nitrosamines in alcoholic beverages, which involves a single step liquid-liquid extraction on a Preptube using dichloromethane, followed by concn. of the eluate and analysis by GLC-Thermal Energy Analyser. The method, sensitive at the 0.2 mg/l level for *N*-nitrosodimethylamine (NDMA), was applied to alcoholic beverages purchased from liquor stores in Massachusetts and at state liquor stores in New Hampshire. Recovery studies were conducted by spiking the liquor samples with 5 mg/l of each of 7 *N*-nitrosamines. Range of recoveries and detection limits are tabulated for the nitrosamines in the spiked liquor samples. Volatile nitrosamines were not found in any of the wines (19 samples), sherries (3), liqueurs (4), gin (3), vodka (3) and rum (3). All 18 brands of domestic and imported beer contained NDMA at levels ranging from 0.4 to 7.0 mg/l and 6 of the 7 brands of Scotch whisky also contained NDMA at levels between 0.3 and 2.0 mg/l. VJG

175

Isolation and identification of the volatile constituents of fresh lemon juice.

Mussinan, C. J.; Mookherjee, B. D.; Malcolm, G. I.
Abstracts of Papers, American Chemical Society 178 (1) AGFD 54 (1979) [En] [IFF-R&D, 1515 Highway 36, Union Beach, New Jersey 07735, USA]

Although lemon oil has been extensively studied, no reference to analysis of lemon juice exist in the literature. This paper describes isolation and identification of the volatiles of fresh lemon juice. Juice was squeezed from 5600 lb of lemons, treated with ethanol, and continuously extracted with Freon 11. The extract was fractionated via standard chemical and

chromatographic techniques and analysed by coupled GLC-MS. More than 300 compounds were identified including a series of novel terpene ethers whose spectra and organoleptic properties are discussed in detail. The structures of several sesquiterpene alcohols identified are also discussed. AS

176

[The volatile fraction of orange juice. III. Total volatiles analysis.]

Alberola, J.; Izquierdo, L.

Revista de Agroquímica y Tecnología de Alimentos 19 (4) 469-482 (1979) [many ref. Es, en] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

The main techniques for isolation and concn. of total organic volatiles from orange juice used to prepare aroma samples for GLC analysis are reviewed. Detailed attention is given to methods using distillation and extraction of distillates with organic solvents, rectification, and direct solvent extraction of the juice. [From En summ.] [See FSTA (1980) 12 8H1247 for part II.] RM

177

Analysis of cold-pressed grapefruit oil by glass capillary gas-chromatography.

Wilson, C. W., III; Shaw, P. E.; Berry, R. E.

Abstracts of Papers, American Chemical Society 178 (1) AGFD 53 (1979) [En] [USDA Citrus & Subtropical Products Lab., PO Box 1909, Winter Haven, Florida 33880, USA]

Quantitative information on grapefruit peel oil components is not as extensive as that for the other major citrus oils. Components of cold-pressed grapefruit peel oil were quantitated on a 60-m glass capillary column coated with Carbowax 20M. Both normalization and external standard methods of quantitation were used and the results were compared. 35 compounds were quantitated; these results were compared with those previously obtained from a 1/8-in. x 20 ft. packed column. Several compounds not quantitated previously in grapefruit oil were quantitated by this method, including limonene oxide, linalool oxide, octanol, decyl acetate, decanal, neral and citronellyl acetate. These were newly quantitated compounds. Some of these had not been reported by other workers as grapefruit oil constituents. These data are important in assessing grapefruit oil quality and in determining natural toxicity of citrus oils to the Caribbean fruit fly. AS

178

[Identification of γ - and δ -lactones in peach aroma (*Prunus persica*) by GLC.]

Fresneda, P. M.; Molina, P.; Soler, A.

Anales de Bromatología 30 (3/4) 235-240 (1978) [6 ref. Es, en] [Univ. de Murcia, Murcia, Spain]

γ - and δ -lactones in peach aroma extracts (var. Maruja) were studied by GLC using Apiezon L, Carbowax 20 M and capillary Carbowax 20 M columns. The following were identified: γ -hexa, γ -octa, δ -octa, γ -nona, γ -deca, δ -deca, γ -dodeca and δ -dodecalactone; γ -hepta, δ -nona and δ -undeca-lactones were absent, γ -valero, γ -hepta and γ -undecalactones doubtful, but probably present. RM

179

[Biosynthesis of organic volatile products from apple (*Pirus malus* L.); ketones synthesis and metabolic differences of varieties.]

Paillard, N.

Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, D 288 (1) 77-80 (1979)

[10 ref. Fr, en] [Lab. de Physiologie Vegetale Appliquee, Univ. Pierre-et-Marie-Curie, Tour 53, 4, Place Jussieu, 75230 Paris Cedex 05, France]

Formation of volatile organic compounds (alcohols, esters and ketones) in the epidermal and parenchymal tissue of apples was studied with the aid of small discs cut from the surface of the fruit and suspended in buffer solution in the presence of a range of fatty acids of chain length from C4 to C11. The behaviour of apple tissue of the Canada gris var., with a corky epidermis, was compared with that of other var. (Calville blanc, Starking) having a waxy cuticle. Fairly large quantities of alcohols (butanol, hexanol) were synthesized by all 3 var., but the production of esters (e.g. buyl buyrate) was lower in the case of Canada gris, which was also distinguished by a very much enhanced production of ketones; even-number fatty acids were transformed into 2-pentanone, 2-heptanone and 2-nonanone by β -oxidation, while odd-numbered fatty acids (e.g. C11) were converted to 2-hexanone and 2-octanone. These differences may account for the poorer level of aroma marking apples of the Canada gris var. BDH

180

[Artificial drying of cocoa beans.]

Jacquet, M.; Vincent, J.-C.; Hahn, J.; Lotode, R. *Cafe-Cacao-The* 24 (1) 43-56 (1980) [18 ref. Fr, de, en, es] [IFCC, Montpellier, France]

The object of this study was to plot cocoa bean drying curves under different conditions of air flow rate, air temp., and thickness of cocoa bean layer to determine the transfer coeff. for a drying period at constant rate, and also the resistance to drying and diffusion for a drying period at a slowed-down rate. The properties of cocoa produced by artificial and solar drying were compared in regard to pH, volatile acidity and total acidity of cotyledons, microbial contents of whole beans, bitterness, organoleptic acidity and aroma of the chocolate. Results, shown graphically and in tables, suggested optimal drying conditions of air temp. 65-70° and moderate air flow of 0.4-0.5 m/s, to avoid caking. Multiple regression analysis showed that the only significant effects were an increase in volatile acidity and reduction in yeast counts with rise in drying temp. Artificial drying had no significant effect on chocolate aroma or bitterness. [From En summ.] RM

181

[Flavour compounds in bread and flavourings for bread and pastries.] Aromastoffe von Brot und Aromen für Brot und feine Backwaren.

Daffertshofer, G.

Gordian 80 (1/2) 17-18, 20 (1980) [6 ref. De] [Silesia G. Hanke KG, Neuss, Federal Republic of Germany]

182

Analysis of volatiles in flavor-scored vegetable oils and detection of flower petal essences by unconventional instrumental means.

Dupuy, H. P.; Rayner, E. T.; Schuller, W. H.

Perfumer & Flavorist 4 (5) 45-46, 48 (1979) [18 ref. En]

[S. Reg. Sci. & Education Administration, USDA, New Orleans, Louisiana, USA]

The direct unconventional GLC procedure of Dupuy et al. [see FSTA (1972) 4 6N278] is described as applied to soybean oil and flower petals. By providing a tangible record of volatiles profiles, this method offers a potential for establishing reproducible quality standards and for monitoring raw materials and products. It is illustrated by volatiles profiles from 3 flavour-scored soybean oils. RM

183

[Fermented milk products with bio-additions.]

Druzhinina, L. N.; Kochkin, D. A.

Izvestiya Vysshikh Uchebnykh Zavedenii,

Pishchevaya Tekhnologiya No. 4, 73-74 (1979) [3 ref. Ru]

[Moskovskii Ordena Trudovogo Krasnogo Znameni Inst. Narodnogo Khozyaistva im. G. V. Plekhanova, Moscow, USSR]

The effect of addition of orotic acid and potassium orotate (naturally occurring in yeast, blood serum, and bacteria) on the formation of acids and aroma in fermented milk products similar to acidophilic paste, was studied. Flavour of the products was improved by their presence, optimum concn. being 0.16%; orotic acid and its salt affected the accumulation of volatile acids and esters, and improved product consistency. The fat fraction produced only a negligible effect on the accumulation of acids and esters. STI

184

The flavor components in fish and shellfish.

Konosu, S.; Yamaguchi, K.

Abstracts of Papers, American Chemical Society 178

(1) AGFD 32 (1979) [En] [Lab. of Marine Biochem., Univ. of Tokyo, Bunkyo-Ku, Tokyo, Japan]

Flavour of fish and shellfish is attributable chiefly to extractive components. The hot-water extract of tissues contains: low mol. wt. N compounds such as free amino acids, peptides, nucleotides and related compounds; substantial quantities of organic bases; and smaller amounts of non-N compounds such as organic acids, sugars, and inorganic compounds. The composition of these compounds shows some common features in the various spp. of fish, crustaceans, molluscs, and echinoderms but at the same time, even among related spp. slight differences are noticed which give rise to delicate variation in flavour. The composition of the extractive components may be influenced not only by season of catch, growth stage of animals and environmental conditions, especially by salinity of water in which they live, but also by location and freshness of the sp. The difference is also observed between wild and cultured fishes. With the current progress in analytical techniques, the cases in which distribution of N compounds in the extract has been almost completely determined are rapidly increasing in number. In a recent

study the authors analysed extracts from the leg meat of 5 spp. of boiled crabs and elucidated > 90% of their DM. Composition and distribution of those flavour components in fish and shellfish are discussed. AS

185

The effects of processing on flavor volatiles in seafood.

Flick, G. J.; Burnette, J. A.; Ory, R. L.; Legendre, M. *Abstracts of Papers, American Chemical Society* 178 (1) AGFD 26 (1979) [En] [Food Sci. & Tech. Dep., Virginia Polytechnic Inst. & State Univ., Blacksburg, Virginia 24061, USA]

The effect of processing on seafood volatiles was investigated by 2 methods of gas chromatographic analysis. 1 method employed direct introduction of the sample into the chromatograph while the other required a prior extraction procedure. Thermal processes employed in the shellfish industry to facilitate shucking or picking may result in little or complete destruction of particular volatiles. Additional volatile losses may occur during subsequent unit processing operation as washing, fluming, drying, concn., pasteurization, and canning. Seafood volatiles in extracts, as clam juice, may also be affected by certain thermal processes. Retorting and vacuum concn. have the greatest affect. Little difference in flavour profiles existed when freeze-dried and spray-dried juices were compared. Consequently, one important consideration in choosing a drying process might be the energy requirements for waste removal. AS

186

Use of enzymes in the production of vegetable food flavouring extracts.

Tateo, F.

Enzyme and Microbial Technology 1 (4) 282-286 (1979) [3 ref. En] [Inst. of Food Tech., Milan Univ., Via Celoria, 2-20133 Milan, Italy]

Experiments were undertaken to develop new technologies that could give more thorough extraction of increasingly scarce flavouring principles from vegetables. The study examined the effects of action of the depolymerizing enzyme, hemicellulase, and influence of alcohol concn. during the infusion that follows enzymic treatment of the vegetable, upon quality and quantity of the flavouring product. The products thus obtained were submitted to organoleptic and analytical tests, and compared with extract flavourings commonly used to produce alcoholic beverages and soft drinks. Obtained extract yields (OEY) were also assessed: the OEY obtained during enzymic treatments, compared with simple static infusion yields, appears to justify, to all practical purposes, the use of hemicellulase. AS

187

[New phellandrene derivatives from the root oil of *Angelica archangelica* L.] Neue Phellandren-Derivate aus dem Wurzelöl von *Angelica archangelica* L. Escher, S.; Keller, U.; Wilhalm, B. *Helvetica Chimica Acta* 62 (7) 2061-2072 (1979) [28 ref. De, en] [Firmenich SA, 1211 Genf 8, Geneva,

Switzerland]

5 previously unknown pelliandrene derivatives with a typical Angelica smell were isolated from the fraction b.p. 34-47°C/0.02 torr of Angelica root oil [i.e. 2-nitro-1,5-p-menthadiene; *cis* and *trans* 6-nitro-1(7)2p menthadiene; *trans*-1(7) 5-p-menthadien-2-yl acetate; 7-isopropyl-5-methyl-5-bicyclo (2.2.2.) octen-2-one. The elucidation of their structure and synthesis are described. RM

188

[Determination of pulegone in mint essential oil.] Mannino, S.; Amelotti, G.

Rivista Italiana delle Sostanze Grasse 56 (2) 61-62 (1979) [3 ref. It, en] [Istituto di Chimica Agraria, Univ., Milan, Italy]

A method is described for quantitative GLC detn. of pulegone in mint essential oil, using tridecane as internal standard (coeff. of variation for 10 replicates < 3%). Tabulated results from 12 commercial samples showed pulegone contents of 0.38-1.43% in 11 samples of varying origin and variously treated, and 3.85% in 1 crude mint oil sample. RM

189

[Distribution of essences and essential oils in confectionery.] Betrachtungen zur Verteilung von Essenzen und ätherischen Ölen in Süßwaren. Daffertshofer, G.

Gordian 79 (11) 283-284, 286 (1979) [De] [Silesia J. Hanke KG, Neuss, Federal Republic of Germany]

Types of commercial aroma preparations - essences, essential oils, oleoresins, extracts, distillates - are defined and the distribution of essences and essential oils in the multi-phase systems prevailing in food products described, mainly in terms of the differing polarities of the aroma preparations and the basic medium. RM

190

Development of instrumental analytical methods for essential oils and aroma chemicals.

Rogers, J. A., Jr.

Perfumer & Flavorist 3 (6) 41-47 (1979) [En]

This survey traces the history of instrumental methods of analysis, i.e. IR and UV spectroscopy, chromatography, MS and NMR, and the influence of instrumentation on quality control and development of new flavour and fragrance products. RM

191

Investigations on equilibrium headspace - open tubular column gas chromatography.

Ettre, L. S.; Purcell, J. E.; Widomski, J.; Kolb, B.; Pospisil, P.

Journal of Chromatographic Science 18 (3) 116-125 (1980) [19 ref. En] [Instrument Div., Perkin-Elmer Corp., Norwalk, Connecticut 06856, USA]

After a brief summary of the basis of gas chromatographic headspace analysis and the available instrumentation, the use of this technique with open-tubular columns is discussed in detail, and applications

illustrated with natural samples including cereal, tea and paprika. AL

192

Separation of saturated and unsaturated aldehyde and ketone 2,4-dinitrophenylhydrazone derivatives by reversed-phase high-performance liquid chromatography.

Vigh, G.; Varga-Puchony, Z.; Hlavay, J.; Petro-Turcza, M.; Szarföldi-Szalma, I.

Journal of Chromatography 193 (3) 432-436 (1980) [16 ref. En] [Inst. for Analytical Chem., Univ. of Chemical Eng., Veszprem, Hungary]

An interest in the carbonyl profile of fresh tomato and tomato products led to studies using reversed-phase HPLC for the separation and tentative identification of the components in raw carbonyl aroma fractions pre-separated by TLC, and for the detn. of precise retention data (k' vs. eluent composition and C number), reported here, of 2,4-dinitrophenylhydrazone derivatives of C1-C12 saturated aldehydes, C3-C11 saturated ketones, C3-C7 saturated symmetrical ketones and C3-C8 monounsaturated straight-chain aldehydes. AL

193

[Determination of minor volatile constituents of spirits. I. Tequila.]

Incitti, S.; Tommasini, A.; Pascucci, E.

Rivista della Societa Italiana di Scienza dell'Alimentazione 9 (1) 43-50 (1980) [13 ref. It] [Lab. Chimico Cent. delle Dogane, Rome, Italy]

A method for analysis of minor volatiles in spirits by GLC on a 10% FFAP on Chromosorb W AW 60/80 column is described; amyl alcohol is used as the internal standard. This technique and the official analytical technique were applied to 10 samples of tequila. Tables of results are given. 25 volatiles were identified: there were also 6 unidentified peaks. Agreement between values determined by GLC and by the official method was not close. A table of data is given showing ratios between concn. of the various volatile constituents, determined by GLC. The possibility of establishment of characteristic values for the concn. and/or ratios of volatiles in tequila is briefly considered. AJDW

194

Report of the technical subcommittee on ethanol in beer. [Lecture]

Williams, R. S. (Chairman)

Journal of the American Society of Brewing Chemists 37 (3) 137-139 (1979) [4 ref. En]

An isothermal gas chromatographic (GC) technique for the measurement of ethanol in beer was evaluated and shown to be equivalent in terms of accuracy and precision to the standard ASBC (American Society of Brewing Chemists) reference method. The GC method is recommended for adoption as an alternative to the standard method. [See FSTA (1980) 12 11H1586.] JRR

195

[Role of the yeast strain in producing volatile substances during grape juice fermentation.]

Souffleros, E.; Bertrand, A.

Connaissance de la Vigne et du Vin 13 (3) 181-198 (1979) [21 ref. Fr, en, de, es, it] [Inst. d'Oenologie, Univ. Bordeaux II, 351, Cours de la Liberation, 33405 Talence Cedex, France]

50 samples of 17 yeast strains (listed), isolated and identified in 1975 and 1976 in the vineyards of Naoussa in N. Greece, were used for a study of 20 volatile substances (tabulated for results) formed during fermentation of wine. 600 ml samples of white grape juice were inoculated with 5 ml of each culture, fermented under anaerobic conditions at 25°C and oxygenated after 24 h. After investigation by gas chromatography with ion flame detection, the strains were classified according to the volatile substances detected, viz. alcohologenic (notably *Saccharomyces cerevisiae*), producing most higher alcohols and esters; fairly alcohologenic, producing relatively small quantities of volatile substances; only slightly alcohologenic (notably *Torulopsis* and *Hanseniaspora*), producing only minute quantities of volatile substances except ethyl acetate; and pathogenic yeasts (*Pichia*, *Saccharomycodes ludwigii*), producing large quantities of ethyl acetate. Data on polyols (glycerol, 2,3-butanediol) are also tabulated. KME

196

Methanol, ethanol and acetaldehyde content of citrus products.

Lund, E. D.; Kirkland, C. L.; Shaw, P. E.

Abstracts of Papers, American Chemical Society 178 (1) AGFD 7 (1979) [En] [US Citrus & Subtropical Products Lab., PO Box 1909, Winter Haven, Florida 33880, USA]

Correlations between profile of organic volatiles and storage history or product quality factors could be used to determine quality of citrus products. The major volatiles, methanol, ethanol and acetaldehyde were quantitatively determined in citrus products by a direct injection-gas chromatographic procedure. Samples of canned and bottled juice, concentrate and sections from supermarkets and processing plants, were analysed by direct injection on a Porapak column using a removable glass injection port liner. Relationships were examined between concn. of volatiles and °Brix, acid and pulp content. The effect of storage at elevated temp. was also studied. Concn. of these volatiles in stored, heat-treated juices did not change. Rapid changes were observed in stored glass-packed grapefruit sections but not in canned sections. Significant differences were found between fresh and heat-treated juices. Some of the correlations observed could form the basis for rapid quality tests on products. AS

197

[Effect of three different storage methods on aroma production in fruit.] Beeinflussung der Fruchtaromaproduktion durch drei verschiedene Lagerverfahren.

Shatat, F.; Bangerth, F.; Neubeller, J.
Gartenbauwissenschaft 43 (5) 214-222 (1979) [16 ref
De, en, fr, ru] [Inst. für Obst-, Gemüse- & Weinbau,
Univ. Hohenheim, Postfach 106, 700 Stuttgart 70,
Federal Republic of Germany]

Effects of storage under different conditions on the extent of aroma promotion and the level of volatile constituents generated by Golden Delicious apples were investigated by means of GLC. Storage conditions included a normal refrigerated store (control), storage under reduced pressure (50 or 100 torr) and controlled-atmosphere storage; a limited number of experiments with bananas were also performed. In all cases, fruit stored under reduced pressure showed a rapid decline in the concn. of aromatic substances, which were almost reduced to zero after 12 wk. For apples in refrigerated stores, both the nature and amount of volatiles increased progressively during storage, the number of identifiable peaks corresponding roughly with those of apples ripened at ambient temp. In controlled-atmosphere stores, however, while there was a quantitative increase in the concn. of volatiles, these consisted primarily of only 2 compounds - ethanol and ethyl acetate, their production being 50-100 times greater than in fruits stored in ordinary chill stores. A final 1-2 wk shelf storage at ambient temp. had no noticeable effect on the aroma production of fruit stored under reduced pressure or in controlled-atmosphere stores. BDH

198

[Application of luminescence analysis to quality control of fried vegetables.]

Privalko, I. P.; Avramenko, V. N.; Lyubivaya, A. I.; Kabanova, N. N.

Konservnaya i Ovoshchesushil'naya Promyshlennost'
No. 8, 42-43 (1979) [Ru] [Ukrainskii Nauchno-issled. i
Konstruktorskii Inst. Prodovol'stvennogo
Mashinostroeniya, USSR]

Changes in the spectra of fried products were studied, i.e. particularly oxidative changes in the composition of vegetable oil during heating. Apparatus used for fluorescence spectra recording is briefly described. In the case of pumpkins, carrots and onions no correlation was established between fluorescence intensity and frying time. STI

199

The chemistry of baked potato flavor.

Coleman, E. C.

Dissertation Abstracts International, B 40 (7) 3078:
Order no. 79-28389, 322pp. (1980) [En] [Rutgers Univ.,
New Brunswick, New Jersey 08903, USA]

The aims of this study were to isolate a true and genuine baked potato flavour and to identify its volatile flavour components. Volatile flavour compounds were isolated from Idaho Russet Burbank potatoes which had been baked at 205°C for 105 min. Organoleptic evaluation of the flavour isolate obtained indicated it to be of excellent quality. In order to identify the volatile flavour components, extensive gas chromatographic fractionation was performed with different stationary phases until pure fractions were obtained. The 420 fractions obtained were identified by a combination

of IR spectrometry and MS. 244 compounds were identified including 32 pyrazines, 19 ketones, 14 acids, 29 aldehydes, 23 alcohols, 18 esters, 13 halogen compounds, 3 thiazoles, 4 ethers, 2 oxazoles, 9 furans, 5 S compounds, 8 N compounds, 25 saturated hydrocarbons, 38 unsaturated hydrocarbons and 2 miscellaneous compounds. Results indicated that a true baked potato flavour is the result of a mixture of a number of components; 32 key components were identified including pyrazines, oxazoles, thiazoles, naphthalenes and a furanone. The halogen compounds found are of significance because of their possible precursors and toxic properties. Possible formation mechanisms are postulated for a number of important components of baked potato flavour. JA

200

The influence of roasting time on the flavor quality of fresh roasted peanuts.

Buckholz, L. L., Jr.

Dissertation Abstracts International, B 40 (7) 3077-3078: Order no. 79-28385, 219pp. (1980) [En] [Rutgers Univ., New Brunswick, New Jersey 08903, USA]

2 peanut var. (Runner 1 and Spanish) were roasted at 163°C in a 2-directional, forced hot air batch roaster for 7, 8 and 9 min to achieve, resp., light, medium and dark roast samples. The effect of roasting time on flavour was determined by sensory evaluation and instrumental analysis. Runner 1 medium roast and Spanish dark roast samples showed optimum flavour quality. Adsorption polymer collection employing Tenax gas chromatography and cryogenic collection were employed for collecting headspace volatiles formed during roasting. The reproducibility of both collection methods was good, as evidenced by a coeff. of variability of 3.2%. Gas chromatography was used to separate and quantitate the headspace volatiles. The quantitated volatiles were identified by MS; 67 compounds were identified, of which 7 had not previously been reported. As roasting time increased, the amounts of carbonyls decreased and amounts of pyrazines increased. Statistical analysis was used to correlate the results of sensory analysis with the gas chromatographic characteristics of peanut aroma; results indicated that only 2 peak combinations were needed to correlate well with the strength and desirability of odour and flavour. Coeff. of detn. was used as a measure of correlation which averaged 0.9201 for all correlations attempted. JA

201

Correlations between aroma and volatile composition of McIntosh apples.

Panasiuk, O.; Talley, F. B.; Sapers, G. M.

Journal of Food Science 45 (4) 989-991 (1980) [En]
[USDA E. Reg. Res. Cent., SEA-AR, 600 E. Mermaid
Lane, Philadelphia, Pennsylvania 19118, USA]

The relationship between aroma and volatile composition of McIntosh apples was investigated. Significant correlations were found between aroma qualities determined organoleptically by a trained panel and by GLC. Unripe apples contained low levels of all volatiles and exhibited grassy and green aroma notes. C-6 aldehydes correlated with overall aroma intensity.

ripeness, and fruity and aromatic notes. Esters correlated with a cheesy aroma note. Overripeness correlated with esters and total peaks in unstored but not in stored apples. The GLC peak groups which previously were found to correlate with physical and chemical properties related to maturity in unstored McIntosh apples also correlated with aroma. IFT

202

Chemistry of baked potato flavor: further identification of heterocyclic compounds in the volatile flavor of baked potatoes.

Ho, C.-T.; Coleman, E. C.

Journal of Food Science 45 (4) 1094-1095 (1980) [En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ., New Brunswick, New Jersey 08803, USA]

The gas chromatographic fractions of a baked potato flavour which was isolated from 540 lb of Idaho Russet Burbank potatoes were analysed by IR and MS. A large number of heterocyclic compounds were identified. This paper reports the identification of 9 furans, 2 oxazoles, 3 thiophenes, 2 pyrroles, 2 pyridines, 1 dioxolane, and 1 trioxane. It was noted that heterocyclic compounds with formyl or acetyl substituents had aromas with nutty characteristics. IFT

203

Analysis of carrot volatiles collected on porous polymer traps.

Simon, P. W.; Lindsay, R. C.; Peterson, C. E.

Journal of Agricultural and Food Chemistry 28 (3) 549-552 (1980) [11 ref. En] [Dep. of Hort., USDA, Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

An accurate and precise porous polymer trapping method was adapted for the GLC analysis of volatiles from raw carrots. Small samples (25 g) can be employed, 25-30 samples can be collected/day, and the resulting chromatograms are similar to those obtained through conventional Likens-Nickerson distillations. Evaluation of the method revealed that relative to the selected blending procedure in sample preparation, slicing carrot roots enhanced the levels of caryophyllene and α -bisabolene while grating roots resulted in a reduction in total levels of volatiles. More volatile terpenes were found in the crown of roots than in midsection or tip sections, but exceptions were noted. Terpinolene and carophyllene levels were higher in the phloem than in the xylem of roots. AS

204

Correlations between sensory and objective parameters of carrot flavor.

Simon, P. W.; Peterson, C. E.; Lindsay, R. C.

Journal of Agricultural and Food Chemistry 28 (3) 559-562 (1980) [14 ref. En] [Dep. of Hort., USDA, Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Stepwise multiple regression of 5 sensory parameters and 21 objective variables demonstrated that sugars and individual or summed total volatile terpene compounds are important in determining raw carrot flavour. The relative importance of each objective variable varies by the location in which carrots are grown and the genetic background of the carrot. Harsh,

turpentine-like flavours are associated with the presence of the volatiles, particularly γ -terpinene and total volatiles, and a reduction in sugars. The reverse is true for sweetness and overall preference which are enhanced by sugars and diminished by volatiles. Overall carrot flavour is heightened by a reduction in total volatiles. Sucrose levels correlate positively and reducing sugars negatively with volatile terpene levels. For the growing sites represented, genetic variation was significant for reducing sugars, terpinolene, sucrose, α -phellandrene, limonene, and total volatiles, while environmental variation was significant for dry wt., refractive index, carotenoids, sucrose, total sugars, and terpinolene. AS

205

[Method of and apparatus for estimation of the amount of liquid component in a medium.] Verfahren zur Bestimmung des Anteils einer flüchtigen Komponente in einem Medium sowie Einrichtung zur Durchführung eines solchen Verfahrens.

Grundmann, J.; Wulf, H.; Plonis, G. F. (Walter Rau Lebensmittelwerke)

German Federal Republic Patent Application 2 835 796 (1980) [De]

A method of automatic process control in the manufacture of margarine includes apparatus for estimating the amount of volatile matter present by running a measured quantity of molten margarine over an electrically heated resistance to remove volatiles while measuring the current consumption. W&Co

206

[Recent advances in the research on tastes and odours of fats and oils.] [Review]

Usuki, R.; Kaneda, T.

Journal of Japan Oil Chemists' Society [Yukagaku] 28 (10) 717-723 (1979) [53 ref. Ja] [Fac. of Agric., Tohoku Univ., Sendai, Japan]

207

[Sulphur compounds of rapeseed oils.] [Lecture]

Devinat, G.; Biasini, S.; Naudet, M.

Revue Francaise des Corps Gras 27 (5) 229-236 (1980) [15 ref. Fr, de, en, es] [Lab. Nat. des Matieres Grasses ITERG, Univ. d'Aix-Marseille, Place Victor Hugo, 13331 Marseille Cedex 3, France]

In Cruciferae oils (e.g. rapeseed oil), S is determined accurately and reproducibly by microcoulometry. Tabulated data show the variations in S contents of raw oils, and their decrease during refining. The proportions of the 3 classes of S compounds (volatile, heat-labile, non-volatile) are different in each oil and change at varying rates during refining but are never reduced to zero. The volatile and to a lesser degree the heat-labile compounds inhibit the hydrogenation catalysts. Volatile S compounds isolated by cold finger technique and studied by GLC with special detector were identified as aliphatic isothiocyanates (vinyl, allyl, butenyl, pentenyl), and some medium-volatile aromatic isothiocyanates (phenyl, phenethyl). The microcoulometric, cold finger and GLC methods are described in detail. RM

208

[Changes in volatile components formed in salted and dried sardine during frozen storage. I. Search for origin of volatile components.]

Iida, H.; Nakamura, K.; Tokunaga, T.

Bulletin of the Tokai Regional Fisheries Research Laboratory [Tokai-ku Suisan Kenkyusho Kenkyu Hokoku] No. 98, 77-85 (1978) [10 ref. Ja, en]

Changes in the quality and composition of salted dried sardine during frozen storage for 5 months at -10°C are described. Studies were conducted on the fish before drying, immediately after drying, and after frozen storage in air, in N_2 or in O_2 . Both muscle and viscera were examined. Aspects evaluated included colour, odour, oil content, peroxide and acid values of the oil, volatile fatty acid concn., volatile basic N concn., volatile carbonyl compound concn., and fatty acid composition. Tables of results are given. Appearance and odour of samples stored in O_2 were inferior to those of samples stored in air or N_2 . Peroxide value increased considerably during frozen storage in all samples, the increase being greatest for those stored in O_2 and least for those stored in N_2 . Changes in volatile acids concn. were very small. Changes in concn. of volatile basic N and volatile carbonyl compounds followed a similar pattern to changes in peroxide value. Proportions of propionaldehyde and acetaldehyde in the total carbonyl increased considerably during frozen storage. GLC studies showed propionaldehyde and an unidentified peak (possible *n*-valeraldehyde) to be the predominant volatiles formed during frozen storage. [From En summ.] AJDW

209

[Changes in volatile components formed in salted and dried sardine during frozen storage. II. Variation in parts of fish.]

Iida, H.; Nakamura, K.; Tokunaga, T.

Bulletin of the Tokai Regional Fisheries Research Laboratory [Tokai-ku Suisan Kenkyusho Kenkyu Hokoku] No. 98, 87-92 (1979) [4 ref. Ja, en]

Studies were conducted on formation of volatiles in the (i) light muscle (ii) dark muscle, and (iii) skin + subcutaneous adipose tissue of salted dried sardines during frozen storage at -10°C for ≤ 4 months. Volatiles were determined and identified by GLC-MS. Peroxide value of (iii) increased considerably during frozen storage; changes in the peroxide value of (i) and (ii) were smaller. Approx. 20 peaks were present on GLC chromatograms of (i)-(iii) samples. Most volatiles were formed in (ii) and (iii), not in (i). The increase in volatiles concn. during storage was mainly attributable to aldehydes originating from fat. Concn. of acetaldehyde, propionaldehyde and *n*-valeraldehyde (but not *n*-butyraldehyde) increased considerably. Addition of BHA appreciably reduced formation of volatiles during storage, but had little effect on the range of volatiles present. [From En summ.] [See preceding abstr. for part I.] AJDW

210

Instrumental flavor analysis of meat products containing cottonseed proteins.

Fore, S. P.; Legendre, M. G.; Cherry, J. P.; Berardi, L. C.;

Vinnett, C. H.

Journal of Food Science 45 (4) 912-914, 917 (1982) [En] [USDA S. Reg. Res. Cent., SEA-AR, PO Box 1, New Orleans, Louisiana 70179, USA]

Meat loaves supplemented with various amounts of textured storage and classical (nonstorage and storage) protein isolates from glandless cottonseed were analysed for volatile compounds by direct gas chromatography. 17 volatile compounds were identified by combined direct gas chromatography-MS. Natural logarithms of hexanal and hexanol and of ratios of hexanal and hexanol to chloroform correlated well with taste panel scores for aroma, initial flavour, after-taste, and overall flavour. IFT

211

A study on the odor-structure relationship of patchouli compounds.

Mookherjee, B. D.; Light, K. K.; Hill, I. D.

Abstracts of Papers, American Chemical Society 178 (1) AGFD 55 (1979) [En] [IFF, R&D, 1515 Highway 36, Union Beach, New Jersey 07735, USA]

Systematic investigation of patchouli oil resulted in the identification of a novel character-donating trace component, nortetra patchoulol. This discovery shed new light in the study of structural features necessary to produce the characteristic odour properties of patchouli oil. In this regard, a series of new tri, bi and monocyclic compounds were made. Their odour-structure relationship with respect to nortetra patchoulol, norpatchoulol and patchouli alcohol is discussed. AS

212

Separation and characterization of citrus oils by high performance liquid chromatography employing dual detection.

Ernes, D. A.

Dissertation Abstracts International, B 39 (12) 5874-5875: Order no. 79-09450, 121pp. (1979) [En] [Ohio Univ., Athens, Ohio 45701, USA]

The HPLC method developed used a μ -porasil column and a hexane-chloroform gradient and also incorporated a dual detection system involving UV absorption at 254 nm and fluorescence emission, initially at 335 nm excitation and 420 nm emission; the fluorescence method was especially applicable because of the fluorescence properties of the nonvolatile components of citrus oils. The method was applied to lime oil and parameters having an effect on the chromatograms were studied, e.g. re-equilibration time, quality of the mobile phase, solvent used to dilute the injected samples; factors affecting fluorescence detection of citrus oil components were also investigated. The method was also applied to a series of oil samples to note differences in the chromatograms resulting from variations in the origin of the parent fruit. JA

213

[Chemistry of aromatic materials.] Khimiya dushistykh veshchestv. [Book]

Bratus, I. N.

303pp. (1979) [18 ref. Ru] Moscow, USSR; Pishcheva

romyshlennost' Price 0.85r

Theoretical principles of the chemistry of natural and synthetic aroma compounds are discussed, and data on their classification, composition and manufacture and utilization are included. Chapters are: General information (pp. 8-11); Hydrocarbons (pp. 12-23); Alcohols (pp. 24-73); Simple esters (pp. 74-88); Compound esters of carbonic acids and the carbonic acids (pp. 89-139); Lactones (pp. 140-163); Aldehydes and acetones (pp. 164-239); Ketones (pp. 240-271); Aromatic compounds (pp. 272-285); Indoles (pp. 285-288); and Aromatic substances from terpenophenols (pp. 289-301). STI

214

Volatile constituents of *Osmanthus absolute*.

Kaiser, R.; Lamparsky, D.

Abstracts of Papers, American Chemical Society 178 (1) AGFD 52 (1979) [En] [Givaudan Res. Co. Ltd., CH-8600 Dübendorf-Zürich, Switzerland]

A general review is given of the analysis of *Osmanthus absolute*, an interesting raw material for perfumers and flavourists. Structure elucidation and synthesis of several constituents bearing the megastigmane skeleton, especially new cyclic epoxides are discussed in more detail. About 1/4 of the constituents identified in the absolute can formally be considered as carotene breakdown products or derivatives of the latter. The greater part of these constituents is accessible synthetically via oxidative, reductive, photosynthetic or acid catalysed reactions starting from the major components β - and α -ionone. In addition, some new terpenoids as well as unsaturated lactones are described together with further lipid metabolism products. AS

215

Shoyu (soy sauce) flavour components: acidic fractions and the characteristic flavor component. Nunomura, N.; Sasaki, M.; Yokotsuka, T.

Agricultural and Biological Chemistry 44 (2) 339-351 (1980) [24 ref. En] [Cent. Res. Lab., Kikkoman Shoyu Co., Ltd., 399-Noda, Noda-shi, Chiba-ken 278, Japan]

Commercial fermented shoyu flavour components were studied by analysis of acidic fractions obtained by ethylene dichloride extraction of either a volatile flavour concentrate produced by low-pressure distillation of shoyu, or the shoyu directly. 2 acidic fractions of volatile flavour concentrate, and 8 acidic fractions of shoyu extract were studied by GLC and GLC/MS. 93 compounds were identified, 36 for the 1st time as shoyu constituents. Fractions in which the compounds were identified are tabulated. Compounds newly identified in shoyu were 4 alcohols, 2 carbonyls, 4 acetate esters, 3 lactones, 3 furans, 1 furanone, 4 pyrones, 2 phenols, 3 acids, 1 S compound and 9 miscellaneous compounds. Compounds with caramel-like aroma, important for overall shoyu aroma, are discussed. Flavour qualities of individual fractions were assessed, and it is concluded that 4-hydroxy-2-ethyl-5-methyl-3(2H)-furanone [or-5-ethyl-2 methyl-], and to a lesser extent, 4-hydroxy-5-methyl-3(2H) furanone, are chiefly responsible for shoyu aroma. DIH

216

Use of spectral search for identification of the volatiles in a synthetic meat flavor system.

Hsieh, Y. P. C.; Pearson, A. M.; Sweeley, C. C.; Martin, F. E.

Journal of Food Science 45 (4) 1078-1079, 1081 (1980) [En] [Dep. of Food Sci. & Human Nutr., Michigan State Univ., E. Lansing, Michigan 48824, USA]

Volatiles from a synthetic meat flavour mixture were isolated and concentrated using the Likens-Nickerson apparatus. After separation by gas chromatography-MS (GC-MS) the spectra were fed into a forward spectral-search computer programme containing the spectra of > 70 000 catalogued compounds. Tentative identifications were made of the following compounds: 1-undecene, 2,4-dimethyl-undecane, 2,2,4-trimethyl-heptane, acetyl pyrrolidine, furan, 2,2,5,5-tetramethyl tetrahydrofuran, 2-methyl-thiophene, 2,2-dimethyl-3,4-pentadienal, methylethyl ether, 2-butyl-1-octanol, 2,4-bis-(methyl-butyl)-phenol, and 5-methyl-2-furfural. 4 of these compounds have not been identified in meat volatiles. The spectral-search procedure offers many advantages for identification of flavour volatiles, but could be further refined by using only classes of compounds believed to be involved in meat flavour development. IFT

217

Historical and recent developments of essential oils and aroma chemicals. [Review]

Kulka, K.

Perfumer & Flavorist 3 (6) 4-10, 12-13 (1979) [33 ref. En]

This review contains sections on essential oils (sources, classification, processing, conversion), oleoresins (production), conc. fruit juices, natural vs. synthetic products, synthetic organic materials and advances in synthetics, enzyme applications, terpenes, and analytical procedures (wet analyses, physico-chemical procedures). RM

218

[Odour components of *Nigella damascena* seeds.]

Paris, M.; Clair, G.; Nuger, J.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 61 (5) 225-227 (1979) [6 ref. Fr] [Univ. Paris-Sud, Rue J.-B. Clement, 92290 Chatenay-Malabry, France]

TLC, GLC and combined MS-GLC were used to study the volatile compounds of *N. damascena* seeds (a spice with a strawberry aroma). In addition to damascenine and other alkaloids, unidentified components (probably sesquiterpenes) were present. RM

219

Methods of analysis of edible fats and oils.

Cyprus, Organization for Standards & Control of Quality

Cyprus Standard CYS 78:1979, 15pp. (1980) [En] [Min. of Commerce & Ind., Nicosia, Cyprus]

Detailed procedures are given for detn. of relative

density at 1/20°C, detn. of allyl isothiocyanate content, arachis oil test (Evers), sesame oil test (Baudoin), detn. of soap content, and detn. of Fe content. AL

220

[Edible oils and fats. Determination of volatile acids (Reichert-Meißl, Polenske and Kirschner values).]

Iraq, Ministry of Industry

Iraqi Standard IOS 481, 8pp. (1975) [Ar]

221

[Interpretation of the mass spectra of flavour substances occurring in foods. I. Esters.]

Kaminski, E.; Zalewski, R. I.; Przybylski, R.; Zawirska, R. *Chemia Analityczna* 24 (3) 443-459 (1979) [10 ref. Pl]

[Inst. Towaroznawstwa Akad. Ekonomicznej, Poznan, Poland]

56 pure esters were analysed by gas chromatography using a capillary column combined with a quadrupole spectrometer. A scheme was developed for fragmentation of the esters which proved to be useful in the interpretation and identification of unknown esters. It was shown on the example of 14 selected esters that the scheme may be applied satisfactorily for identification of substituted, unsubstituted aliphatic, unsaturated, alicyclic and aromatic esters in foods. STI

222

Flavour isolation from fatty foods via solvent extraction and membrane dialysis.

Benkler, K. F.; Reineccius, G. A.

Journal of Food Science 45 (4) 1084-1085 (1980) [En]

[Dep. of Food Sci. & Nutr., Univ. of Minnesota, 1334 Eckles Avenue, St. Paul, Minnesota 55108, USA]

Solvent extraction of Cheddar cheese and ground beef samples followed by dialysis against pure solvent using a perfluorosulphonic acid membrane was used in the isolation of flavour compounds. Chromatograms obtained using the dialysis technique were compared with those obtained using traditional distillation: solvent extraction methods. The dialysed samples showed good recovery of a wide range of compounds while the distilled samples showed greater recovery of the more volatile compounds. Odours of the distilled and dialysed samples were similar but not identical. IFT

223

[Analysis of spirits by gas chromatography.]

Casagrande, S.

Rivista della Societa Italiana di Scienza dell'Alimentazione 9 (2) 109-120 (1980) [45 ref. It, en] [Lab. Chimico Provinciale, Trento, Italy]

Volatiles were determined by GLC in a total of 123 samples of grappa of various types, qualities, etc. made over the period 1975-1979. Tables of data are given for concn. of ethanol, methanol, acetaldehyde, various higher alcohols, various esters, diacetyl, and furfural. Values for total higher alcohols, total aldehydes, total acids and total esters determined by conventional methods (e.g. colorimetry) are also given. Ratios between various higher alcohols are also given for each sample; characteristic ranges for these ratios

are specified for the various types of grappa studied. It is concluded that GLC analysis is superior to the official analytical techniques for checking the origin, quality and authenticity of grappa. AJDW

224

Volatile flavour components of malt extract.

Farley, D. R.; Nursten, H. E.

Journal of the Science of Food and Agriculture 31 (4) 386-396 (1980) [30 ref. En] [Atkin-Thompson Lab., Procter Dep. of Food & Leather Sci., Univ. of Leeds, Leeds LS2 9JT, UK]

The Likens-Nickerson concurrent steam distillation-solvent extraction apparatus was used to obtain an essence from malt extract. The essence was submitted to combined gas chromatography (GC)-MS, to examination by S-specific and N-specific detectors, and to sensory evaluation of the components eluted from gas chromatographic capillary columns. Some 33 compounds were identified by direct examination by GC-MS, another 14 by trapping and re-injection, which provides an efficient method of concn. and a further 6, which had not been previously identified due to interference from the solvent peak, by the use of charcoal adsorption traps. Results indicate that several compounds need to be combined to simulate malt flavour. The odour contributions of several components are discussed. AS

225

The collection and concentration of aroma components of soft fruit using Porapak Q.

Ismail, H. H.; Tucknott, O. G.; Williams, A. A.

Journal of the Science of Food and Agriculture 31 (3) 262-266 (1980) [10 ref. En] [Univ. of Bristol, Food & Beverages Div., Long Ashton Res. Sta., Bristol BS18 9AF, UK]

Comparison of various methods for collecting aroma components of plums using adsorption on Porapak Q indicated that extracts were more representative of components present above the intact fruit if fruit was loosely packed into the collecting vessel, high gas flows were used for purging and the entrained volatiles adsorbed on to gram quantities of Porapak, kept agitated during collection and then desorbed by eluting with ether. Tight packing of fruit and low gas flows during collection led to extracts with fermented aromas and higher concn. of components associated with microbial action. Heat desorption of volatiles gave poor recoveries of components eluting beyond acetic acid on a Carbowax 20M gas chromatographic column. AS

226

Quantitative composition of volatile constituents in cultivated strawberries, *Fragaria ananassa* cv. Senga Sengana, Senga Litessa and Senga Gourmella. Schreier, P.

Journal of the Science of Food and Agriculture 31 (5) 487-494 (1980) [27 ref. En] [Inst. für Lebensmitteltech. & Analytische Chem. der Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

Volatile components of 3 cv. of cultivated strawberries were studied by gas chromatography

GC)-MS. Employing standard-controlled aroma separation by combined vacuum distillation-liquid-liquid extraction, as well as prefractionation on silica gel, the aroma substances of freshly harvested and deep-frozen strawberries from 2 growing seasons were quantitatively determined by GC. Methyl and ethyl butanoate, methyl and ethyl hexanoate, *trans*-2-hexenyl acetate, *trans*-2-hexenal, *trans*-2-hexen-1-ol as well as (i) 2,5-dimethyl-4-methoxy-3(2H)-furanone were identified as main volatile components. In comparison to Senga Litessa and Senga Gourmella, Senga Sengana showed higher amounts of aroma compounds. In general, deep-freezing decreased the concn. of most of the aroma substances, but higher amounts of (i) were found in deep-frozen berries than in freshly harvested ones. AS

227

Structure and the synthesis of novel constituents of yudzu peel oil and their conversion to related monoterpenes.

Kitahara, T.; Takagi, Y.; Matsui, M.

Agricultural and Biological Chemistry 44 (4) 897-901 (1980) [10 ref. En] [Inst. of Physical & Chem. Res., 2-1 Hirosawa, Wako-shi, Saitama 351, Japan]

2 novel minor components isolated from yudzu peel oil were characterized as monoterpene β -ketols, by their synthesis, and they were converted to related monoterpenes, dihydroneeroloxide, neroloxide, and hortenol. AS

228

Isolation and identification of novel terpene lactones from quince fruit (*Cydonia oblonga* Mill., Marmelo).

Tsuneya, T.; Ishihara, M.; Shiota, H.; Shiga, M.

Agricultural and Biological Chemistry 44 (4) 957-958 (1980) [3 ref. En] [Shiono Koryo Co. Ltd., Nitaka, Yodogawa-ku, Osaka 532, Japan]

Extraction of steam distilled quince fruit with dichloromethane-*n*-pentane gave an essential oil with a strong sweet and fruit odour. Gas chromatographic analysis showed the oil to contain 2 compounds as major components, each of which was isolated by chromatography on silica gel column eluted with *n*-hexane-ether, and subsequent preparative gas chromatography on a PEG 20M 20% column. The 2 isolated compounds were subjected to MS, and were identified as 2,4-*cis*- and 2,4-*trans*-stereoisomers of 2,7-dimethyl-4-hydroxy-5*E*, 7-octadienoic acid lactone. This is the 1st time these lactones have been isolated from a natural source. SP

229

Volatile components after cooking rice milled to different degrees.

Tsugita, T.; Kurata, T.; Kato, H.

Agricultural and Biological Chemistry 44 (4) 835-840 (1980) [11 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Bunkyo-ku, Tokyo, Japan]

4 types of rice milled to different degrees (92, 85, 75 and 50% milled rice) were subjected after cooking to odour evaluation tests and to gas chromatography (GC) and GC-MS analyses by use of the Tenax GC trap and injection techniques. 40 volatile compounds were

identified in cooked rice, and there were significant differences in both the odour of cooked rice and in the quantity of volatile components between 92% milled rice and the other 3 degrees of milling. The correspondence in odour evaluation tests and GC quantitative analysis suggests that the surface layer constituents of the rice grain have an important role in the formation of the odour of cooked rice. AS

230

Chemical composition of odoriferous compounds in Egyptian and Jordanian olive oils.

Salib, A. G.; Abdel-Malek, G. S.; Latif, A.; Abdel-Gabbar, H.

Egyptian Journal of Food Science 4 (1/2) 81-96 (1976, publ. 1978) [11 ref. En, ar] [Biochem. Dep., Fac. of Agric., Zagazig Univ., Egypt]

Steam distillation of olive oils and ether extraction of aged cellular juice left after pressing olives, showed that the odorous compounds of fresh, aged, and rancid olive oils, both of Egyptian and Jordanian origin, were free of N, halogens and S. On the other hand, they all contained unsaturated centres, $\text{CH}_3\text{-C}=\text{O}$ structure, as well as alcohols, aldehydes and esters. The absence of the characteristic odour of fresh olive oils and its appearance during ageing was accompanied by a significant change in pH (from 5.3 to 4.4 after 15 days) of the ageing olive fruit juice. In the IR spectrum of the odorous compounds of both Egyptian and Jordanian olive oils showed great similarity, but those of rancid oils were completely different from those of normal oils, as shown by the disappearance of the peak at 285 cm^{-1} . GLC of the volatile odour extracts of fresh olive oil identified the presence of linalool, linalyl acetate, methyl anthranilate and eugenol. In ageing oil, camphene, myrcene, menthol, nerol, geranol, anethol, menthyl acetate and farnesol were identified. Some of these compounds disappeared from the rancid oil. ESK

231

[Undesirable odour of cooked sardine meat.]

Koizumi, C.; Kieu-Thu, C. thi

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 45 (10) 1307-1312 (1979) [21 ref. Ja, en] [Tokyo Univ. of Fisheries, 4-5-7 Konan, Minato-ku, Tokyo 108, Japan]

Investigations were conducted on the volatile compounds responsible for the undesirable odour characteristic of cooked sardine (*Sardinops melanosticta*) flesh. These odours form when the flesh is subjected to heat processing. Olfactory analysis confirmed that most of the undesirable odour developed from the lipid fraction; development of odour was inhibited by adding potassium bromate and butylated hydroxyanisole (BHA) to the flesh before cooking, but enhanced by ascorbic acid and isoascorbic acid. A slight decrease in the content of polyunsaturated fatty acid of lipids due to thermal degradation was also confirmed from the comparison of fatty acid compositions of lipids in the flesh before and after cooking. Volatile compounds isolated from cooked sardine were analysed by gas chromatography (GC) and GC-MS. 40 compounds, including esters, aldehydes, ketones, alcohols, hydrocarbons, amines, and cyclic

compounds were identified. The aldehydes, alcohols, and hydrocarbons were considered to be derived from thermal oxidation of lipids and to be important contributors to the undesirable odour associated with cooked sardine flesh. AS

232

Studies on extraction of oils and oleoresins from cumin, fennel and fenugreek.

Shankarakutty, S.; Sumathikutty, M. A.; Bhat, A. V.; Mathew, A. G.

Indian Arecanut, Spices & Cocoa Journal 2 (2) 25-30 (1978) [25 ref. En] [Food & Spices Div., CSIR Complex, Trivandrum, India]

Volatile oil from dried fruits or seeds of (i) cumin (*Cuminum* L.), (ii) fennel (*Foeniculum vulgare*) and (iii) fenugreek (*Trigonella foenum graecum* L.) was extracted by Clevenger distillation method while the oleoresins were determined by cold and hot extractions of ground spices with different solvents [methylene chloride, (MC), ethylene dichloride (EDC), acetone (a), hexane (h), alcohol (al), solvent ether (SE)]. Volatile oil content was highest in (i) (2-5%) followed by (ii) 0.7-1.2% and (iii) 0.02%. Oil from (i) was pale yellow with characteristic strong cumin flavour, while (ii) oil was colourless with mild fennel flavour. MC for cold percolation was the best solvent for (i) with respect to yield (14.82%), flavour and consistency. While (al) gave the highest yield (31.04) for solvent extraction followed by (EDC) (22.75) and (a) (17.68). For (ii) with cold percolation (MC) gave the highest yield (12-48%), whereas for solvent extraction it was EDC (24.80%). In case of (iii) (al) gave highest yield for cold percolation (6.80) as well as for solvent extraction (29.02). However alcohol extractives for (i), (ii) and (iii) were not found satisfactory. The variation in contact time for economic and max. recovery of oleoresins using best solvents for each case were as follows: for (i) EDC 1-4 h (14.27-17.37%); (ii) MC 1-4 h (12.48-13.10); (iii) MC 1-4 h (6.12-7.09). As evaluated by a 6-member taste panel, cumin on roasting to 125°C, gave a product which has acceptable colour and aroma, while unroasted seeds were preferred for fennel. CFTRI

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4

TECHNIQUES FOR ANALYSIS OF FLAVOUR VOLATILES

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H. BROOKES

EDITOR

Studies on evaluation of quality of Japanese horseradish ('Wasabi') powder by gas chromatography. IX. Studies on the characteristics of volatile components in the hydrolysates of *Wasabia japonica*, horseradish and mustard.]

Kojima, M.; Nakano, Y.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 26 (5) 209-214 (1979) [Ja, en] [Fac. of Pharmaceutical Sci., Fukuoka Univ., Nanakuma, Nishiku, Fukuoka-shi, Japan]

Characteristics of volatile components in hydrolysates of *W. japonica*, horseradish and mustard were investigated using headspace gas chromatography. R_g value (peak area of *i*-propyl isothiocyanate/that of 3-butenyl isothiocyanate) × 100, *x* value (peak area of *n*-butyl isothiocyanate/that of 3-butenyl isothiocyanate) × 100, and *y* value (peak area of 1-propyl isothiocyanate/that of *sec*-butyl isothiocyanate) × 100 were calculated from the peak areas of volatile components detected. R_g value of *W. japonica* was = to mustard and > horseradish, *x* value of *W. japonica* was > horseradish > mustard, and *y* value of mustard > *W. japonica* > horseradish. The relationship between R_g, *x* and *y* values derived from a mixture of 2 of the above materials and wt. of material in the mixture showed regular curves. The ratio of materials in the mixture could be determined by using the curves. [From En summ.] [See FSTA (1980) 12 6A439 for part VIII.] SP

2

[Volatile losses in the nozzle zone during spray-drying of liquid food.] [Thesis; Perda de volatéis na região de atomização durante a secagem de alimentos por spray drying, 280pp., Pt]

Kieckbusch, T.

Informativo Anual, Faculdade de Engenharia de Alimentos e Agrícola, Universidade Estadual de Campinas No. 7, 62-64 (1979) [Pt, en]

This is a summary of a 1978 thesis from this University. High losses of volatile (aroma) compounds associated with the spray-drying of liquid foods were confirmed in experiments with sucrose and maltodextrane solutions plus added acetates as model foods. Pressure nozzles and a specially developed continuous withdrawal spray sampler were used at different chamber levels. The experiments covered effects of dissolved solids concn., liquid feed and air temp., nozzle pressure, air flow rate, product dwell time and % water evaporated. Results using mathematical models were then compared with the experimental results and were found to predict well the losses in the film zone, but underestimated the losses in the period immediately after formation of the droplets (probably as they did not allow for turbulence and changes in drop size distribution.) [From En summ.] KME

3

[Studies on volatiles from Satsuma mandarin juice. I. Difference of volatile components among each part of Satsuma mandarin (*Citrus unshiu* Marc.) fruit.]

Kaneko, K.; Katayama, O.

Report of the National Food Research Institute

[*Shokuryo Kenkyusho Kenkyu Hokoku*] No. 36, 44-50 (1980) [12 ref. Ja, en]

Results of GLC analysis of the volatile components from peel, flesh and juice sac of Satsuma mandarin fruit (*Citrus unshiu* Marc.) were as follows: about 45 components were detected as volatiles of the peel. Most of the main components were essential oil constituents. *d*-limonene (peak No. 17) content in the peel volatiles was at a high level (Sugiyama var., 83%; and Early var., 65%). Only slight difference was shown between the flesh volatiles and volatiles of the juice sac. Large amounts of methanol (peak No. 6) and ethanol (peak No. 7) were contained in flesh volatiles, the alcohols accounting for about 99% of the total volatiles. Clear differences in the gas chromatogram pattern of peel volatiles were found between Sugiyama var. and the Early var. AS

4

[Studies on volatiles from Satsuma mandarin juice. II. Influence of harvest time and processing on volatile components of Satsuma mandarin (*Citrus unshiu* Marc.) juice.]

Kaneko, K.; Katayama, O.; Ino, K.; Owada, T.

Report of the National Food Research Institute

[*Shokuryo Kenkyusho Kenkyu Hokoku*] No. 36, 51-56 (1980) [3 ref. Ja, en]

The influence of harvest time and method of juice extraction on volatiles of Satsuma mandarin fruit (*Citrus unshiu* Marc.) and its Early var. (Wase) were studied. Large amount of *d*-limonene (peak No. 17), the main component of the peel oil, was found in the juice extracted by In-Line juice extractor, especially in the juice from fully ripe fruit of Early var. The juice from the fully ripe fruit was evaluated by sensory test and generally showed highest points in aroma and quality. However, the juice extracted by reamer type extractor contained small amounts of peel oil constituents and showed little aroma. AS

5

[Studies on volatiles from Satsuma mandarin juice. III. Changes in volatile components of Satsuma mandarin (*Citrus unshiu* Marc.) juice by heat treatment.]

Kaneko, K.; Katayama, O.

Report of the National Food Research Institute

[*Shokuryo Kenkyusho Kenkyu Hokoku*] No. 36, 57-63 (1980) [7 ref. Ja, en]

The influence of heat treatment on volatile components in juices of Satsuma mandarin (*Citrus unshiu* Marc.) and its Early var. (Wase) was studied. The juice was made from peel, flesh and juice sacs, and heated in boiling water for 30 min. In the peel juice, sensory evaluation of the flavour was not influenced by heat treatment, but peak area on gas chromatograms increased markedly. When juice of flesh and juice sac was heated, off-flavour was induced, and many new peaks appeared on the higher boiling fraction of gas chromatograms. Off-flavour (by heat treatment) in juice produced by reamer type extractor was stronger than that in juice produced by In-Line extractor. AS

6

[Volatile constituents of and organoleptic changes in concentrated juice of 'Pear' variety oranges.]
Figueiredo, I. B.; Tocchini, R. P.; Bordini, L. C. A. G. *Boletim do Instituto de Tecnologia de Alimentos, Brazil* 16 (2) 191-207 (1979) [25 ref. Pt, en] [Inst. de Tecnologia de Alimentos (ITAL), Campinas, Sao Paulo, Brazil]

Studies were conducted on samples of canned conc. orange juice processed and stored by 4 methods: (i) canning under vacuum and storage at -20°C ; (ii) pasteurized in a plate-type heat exchanger, canned under vacuum by a hot-fill process and stored at 5°C ; (iii) pasteurized in a spin-cooker, sealed under vacuum and stored at 5°C ; and (iv) pasteurized in a spin-cooker, sealed under N_2 and stored at 5°C . The various juice samples were stored for up to 180 days. Tables of data are given for essential oil and ascorbic acid concn. in the juices, concn. of O_2 and volatiles in the headspace, and organoleptic quality scores. Gas chromatograms of volatiles are also presented. The results show that processing by method (i) gave the best quality retention; quality did not differ significantly between (ii) and (iii) and (iv). AJDW

7

[Studies on aroma of coffee. I. Head space gas chromatographic method using internal standard for determination of aroma of roast and ground coffee.]
Osajima, Y.; Shimoda, M.; Iriki, E.; Ito, H.; Sakane, Y. *Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi]* 26 (3) 105-110 (1979) [Ja, en] [Lab. of Food Analysis, Fac. of Agric., Kvushu Univ., Fukuoka, Japan]

An internal standard method for the gas chromatographic headspace analysis of the aroma of roast and ground coffee was developed. The method involved sealing a glass vessel, containing ground coffee, with a silicon rubber septum from which was hung a filter paper strip. The internal standard solution (3% sec-butanol, in benzyl alcohol) was injected onto the paper strip with a microsyringe. After equilibration at 30°C for 1 h, the headspace gas was analysed by gas chromatography. Results showed that the relative amount of aroma, based on a relative peak height (sec-butanol = 1.00) was little influenced by temp. A linear relationship was found between quantity of internal standard used and its peak height. Reproducibility based on coeff. of variation ranged from 3.2% (propionaldehyde) to 10.0% (n-hexane) for quantitative analysis of aroma constituents in the headspace gas. Aroma characteristics and changes in flavour during storage of ground coffee were studied by comparison of the relative concn. of 10 constituents in the headspace gas of the above control. [From En summ.] SP

8

The flavour components of plum. An examination of the aroma components present in a distillate obtained from fermented plum juice.
Ismail, H. M. M.; Williams, A. A.; Tucknott, O. G. *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 171 (1) 24-27 (1980) [17 ref. En, de] [Food

& Beverages Div., Long Ashton Res. Sta., Bristol, UK]

Capillary GLC and MS analysis of the volatiles present in a distillate from fermented plum juice led to the identification of 54 components comprising 11 hydroxy compounds, 1 acid, 30 esters, 4 carbonvls, 3 lactones and 5 acetals. 30 of these compounds have not previously been reported in fermented plum products. Benzaldehyde, linalool, methyl cinnamate and γ -decalactone are believed, from odour evaluation of the gas chromatographic effluent, to make significant contribution to the plum-like character of this beverage. Of particular interest also is the presence of eugenol, rather than methyleugenol, which is found in unfermented juice distillates. AS

9

[Flavour components of oranges and their utilization.]

Ifuku, Y.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 26 (1) 40-51 (1979) [Ja, en] [Kainan Juice Plant of Agric. Economic Fed. of Wakayama Prefecture, 1294, Hikata Shinhami, Kainan-shi, Wakayama-ken, Japan]

10

Volatile components produced during ontogeny of some cultivated crucifers.

Cole, R. A.

Journal of the Science of Food and Agriculture 31 (5) 549-557 (1980) [15 ref. En] [Nat. Veg. Res. Sta., Wellesbourne, Warwick CV35 9EF, UK]

Changes in the volatile chemicals produced on autolysis were monitored during the development of cauliflower, Chinese cabbage, fodder rape and radish. Compounds were identified from GLC retention times, and MS. 7 of the mass spectrographs not having previously been recorded. Of the 23 compounds identified overall, 19 were extracted from seeds which, whether aged or freshly harvested, contained the max. concn. of volatiles encountered. A rapid decrease in the concn. of volatile hydrolysis products occurred during the first 4 wk of development. Thereafter a steady increase and change in compounds was recorded, usually related to biologically significant events. The enzymic production of these volatile chemicals is discussed with respect to the action of thioglucosidase and epithiospecifier protein. AS

11

Changes of headspace volatile components of soybeans during roasting.

Doi, Y.; Tsugita, T.; Kurata, T.; Kato, H.

Agricultural and Biological Chemistry 44 (5) 1043-1047 (1980) [16 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Bunkyo-ku, Tokyo, Japan]

Soybeans were roasted at 200°C for 10, 20 and 30 min. and their headspace volatiles trapped by Tenax GC were analysed by gas chromatography (GC) and GC-MS and compared with those of raw soybeans. 50 compounds were identified, and the quantity of important compounds for beany flavour, such as hexanal and 1-hexanol, decreased with longer roasting. However, the decrease was not significant, especially

between 10 and 20 min roasting (i.e. 110 and 150°C), while pyrazines, furans and pyrrole were newly formed in this period and increased with roasting. Judging from the results on sensory evaluation, it is evident that the flavour changed from a beany note to a more desirable note at between 10 and 20 min roasting. These findings suggest that the roasted flavour masked the beany flavour. AS.

12

[Changes in the flavour of shortbread-type products as a result of addition of soy flour. II. Studies on biscuits.] Aromaveränderungen bei Feinbackwaren (Mürbeteiggebäck) durch Sojamehlzusatz. Heilmann, W.; Timm, U.; Rapp, A.; Knipser, W. *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 171 (1) 35-37 (1980) [4 ref. De, en] [Inst. für Lebensmittelchem. der Univ. Karlsruhe, Kaiserstrasse 12, D-7500 Karlsruhe 1, Federal Republic of Germany]

Changes of flavour compounds caused by addition of soy flour to shortbread were investigated. The volatile flavour compounds responsible for the quantitative differences between the aromagrams of normal and soy-fortified product, were isolated and the majority were identified by combined GLC-MS analysis. These flavour compounds were 1-hexanol, dimethylpyrazine, 2,3,5-trimethylpyrazine, furfural, benzaldehyde, β -phenylethanol, 2-methyl-3-hydroxypyron, 2-formylpyrrole, and 4-vinylguaiacol. The importance of the soy flour during the baking process on the development of these flavour compounds is discussed. [See FSTA (1979) 11 7M781 for part I.] AS

13

[Volatile flavour compounds of grilled red-fleshed fish; volatile carbonyl compounds and volatile fatty acids.]

Nakamura, K.; Iida, H.; Tokunaga, T.; Miwa, K. *Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi]* 46 (2) 221-224 (1980) [16 ref. Ja, en] [Tokai Regional Fisheries Res. Lab., Kachidoki, Chuo-ku, Tokyo 104, Japan]

To investigate the volatiles responsible for the strong odour produced by grilling sardine and mackerel, fatty acids were determined, and carbonyl compounds were crystallized as their 2,4-dinitrophenylhydrazone derivatives and subsequently analysed by a combination of gas chromatography and MS. 9 different fatty acids including acetic acid and 18 carbonyls e.g. ethanal, propanal, propenal etc. were identified, but no ketones were detected. Some of the fatty acids in the burnt odorous material exceeded slightly the levels at which they are detectable organoleptically. The strong-smelling carbonyls are also assumed to play a role in the odour. It is concluded that the odour is largely attributable to these components, although some unidentified volatiles may be present. [From En summ.] JRR

14

Volatile flavor compounds from beef and beef constituents.

Ching, J. C.-Y. *Dissertation Abstracts International, B* 40 (8) 3644:

Order no. 80-02343, 352pp. (1980) [En] [Univ. of Missouri, Columbia, Missouri 65201, USA]

Flavour volatiles thermally produced by beef constituents (including diffusates of water-soluble, triglyceride and phospholipid fractions, water-insoluble meat residue and defatted meat residue prepared from fresh, raw, lean beef), model systems (containing the beef constituents alone or with amino acid-sugar mixtures or with carbohydrates extracted from flour) and gravies (prepared using cooked beef fat, flour and drippings from roasted beef) were extracted with ether, and isolated and identified by gas chromatography and gas chromatography-MS. 252 compounds were identified of which 120 had not been previously associated with meaty odours or identified as meat volatiles. The compounds identified included acids, alcohols, aldehydes, aromatic compounds, esters, ethers, furans, hydrocarbons, ketones, lactones, pyrazines, pyridines, pyrroles, sulphides, thiazoles and thiophenes. Consideration is given to the origins of the compounds and their pathways of formation and also to their contribution to meat flavour. JA

15

Metabolic activities of *Lactobacillus brevis*. Effect of pH, glucose and butane-2,3-diol.

Hieke, E.; Vollbrecht, D.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 171 (1) 38-40 (1980) [10 ref. En, de] [Max von Pettenkofer-Inst. des Bundesgesundheitsamtes, Bundesgesundheitsamt, Postfach D-1000 Berlin 33]

The effect of pH on the metabolic activities of *Lactobacillus brevis* was studied. Significant changes in the patterns of volatile components were found on increasing the pH of yeast wine from 3 to 6. Butan-2-ol was formed at pH 6; after fermentation the concn. of propan-1-ol was increased by 38.5% at pH 6.62% at pH 4.5, and 30% at pH 3.0. The effect of glucose and butane-2,3-diol on the production of volatile components was examined in a synthetic medium at pH 6.0. It was shown that propan-1-ol was formed exclusively from glucose, whereas ethyl acetate, butan-2-ol and other unknown substances were formed from butane-2,3-diol. The course of ethyl acetate formation from butane-2,3-diol is discussed. AS

16

Identification of some volatile compounds of wine of *Vitis vinifera* cultivar Pinot Noir.

Brander, C. F.; Kepner, R. E.; Webb, A. D.

American Journal of Enology and Viticulture 31 (1) 69-75 (1980) [24 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

66 wine volatiles were identified by gas chromatography-MS, IR, and Kovats indices in an Oakville, California, *Vitis vinifera* cv. Pinot noir wine. Extraction of the neutral fraction with methylene chloride, entrapment of the headspace volatiles with Porapak Q, and condensation of the headspace vapour were compared. The methylene chloride extract consisted mainly of the higher alcohols while the Porapak Q and the headspace condensate consisted principally of esters and ethyl alcohol. 19 alcohols in addition to ethanol and the usual fusel oil alcohols were identified. Acetates of the major alcohols and ethyl

esters of the saturated even numbered fatty acids were most of the 30 identified. 10 components of other functionality were found. The headspace condensate contained only water and the major organic volatiles (12) in identifiable quantities. Identified in the Porapak Q headspace sample were a larger number of volatiles (19), but the methylene chloride extract permitted identification of an even larger number (66). AS

17

Influence of different pressing systems on the composition of volatile constituents in unfermented grape musts and wines.

Kinzer, G.; Schreier, P.

American Journal of Enology and Viticulture 31 (1) 7-13 (1980) [30 ref. En] [Inst. für Lebensmitteltech. & Analytische Chem. der Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

Influence of processing conditions on the composition of aroma constituents in unfermented musts and wines was studied. Unfermented musts from grapes of var. Morio-Muskat and Müller-Thurgau, harvested in 1978 in Rheinpfalz, West-Germany were produced by 3 methods: A) screw press; B) cylindrical Willmes press; and C) method B plus a pressing-aid material. 3 different fractions were obtained (free-run and 2 pressing fractions). Quantitative gas chromatography revealed that the amounts of variably distinct aroma substances, terpene alcohols, and 'terpene oxides' in the pressing fractions increased with pressure. The amounts were nearly the same for systems A and B, and 34-45% less for system C. Losses of varietal volatile substances were detected also in wines from musts of system C. Also studied were changes in fermentation by-products of wines produced from the must fractions processed by different methods. An increase of pressure during pressing resulted in increased formation of ethyl esters and acetates in the corresponding wines. The concn. of these fermentation by-products were highest in wines made from pressing fractions of system C. AS

18

[Types and components of alcoholic beverages. II. Relationship between ageing grade and components of cognac brandy.]

Otsuka, K.; Iki, I.; Yamashita, T.; Totsuka, A.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 74 (8) 549-554 (1979) [10 ref. Ja, en] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

General characteristics and some aroma components of 4 brands of imported bottled cognac were analysed. Close relationships were observed among pH, acetal, and organoleptic scores, between total acids and β -methyl- γ -octalactone, and among ethyl acetate, ethyl caproate, ethyl caprylate, and ethyl caprate. The sum of the odour units (concn./threshold concn.) of some aroma components were correlated with organoleptic scores. Ageing time in yr was estimated from a formula in which the average value of phenethyl alcohol at each grade of 4 brands of cognac was used as a variable.

YN

19

A comparison of the AOAC spectrophotometric method for vanillin and a GLC method for vanillin and ethyl vanillin in alcoholic beverages.

Dyer, R. H.; Martin, G. E.

American Journal of Enology and Viticulture 31 (1) 37-39 (1980) [6 ref. En] [Sci. Services Div., Bureau of Alcohol, Tobacco & Firearms, 1401 Res. Boulevard, Rockville, Maryland 20850, USA]

A comparison of the results of analyses of alcoholic beverage samples for vanillin by the AOAC spectrophotometric method and a GLC method are presented for 25 samples. Overall, the results were in good agreement. The GLC method distinguishes between vanillin and ethyl vanillin and eliminates interferences associated with the spectrophotometric method. The average of 12 detn. indicated a 97% recovery for added ethyl vanillin and 90% recovery for added vanillin. MS confirmation of ethyl vanillin and vanillin separated by GLC was carried out. AS

20

Hydroxylated linalool derivatives as precursors of volatile monoterpenes of muscat grapes.

Williams, P. J.; Strauss, C. R.; Wilson, B.

Journal of Agricultural and Food Chemistry 28 (4) 766-771 (1980) [22 ref. En] [Australian Wine Res. Inst., Private Mail Bag, Glen Osmond, S. Australia 5064, Australia]

Thermal induction of volatile monoterpenes in juices of muscat grapes (*Vitis vinifera* cv. Muscat of Alexandria and Muscat a Petits Grains) was studied by GLC and GLC-MS of headspace samples. The roles of the 4 recently discovered grape polyols 3,7-dimethylocta-1,5-diene-3,7-diol, 3,7-dimethylocta-1,7-diene-3,6-diol, 3,7-dimethyloct-1-ene-3,6,7-triol, and 3,7-dimethyloct-1-ene-3,7-diol are interpreted in this process. Heating juice for 15 min at 70°C significantly increased the concn. of the furan linalool oxides, nerol oxide, hotrienol, and α -terpineol. Also 2,6,6-trimethyl-2-vinylnorbornene, *cis*- and *trans*-5-isopropenyl-2-methyl-2-vinylnorbornene, 2,2-dimethyl-5-(1-methylpropenyl)tetrahydrofuran, myrcenol, and *cis*- and *trans*-ocimenes, all previously unrecognized as grape products, became prominent constituents of heated juice headspace composition. Under mild acid conditions at grape juice pH, the 4 polyols rearranged nonenzymically to give all the above volatile products. AS

21

[Investigation of odour-active compounds in brewhouse vapours and their elimination.]

Untersuchung der geruchsaktiven Verbindungen in Sudhauschwaden und deren Abwendung.

Drawert, F.; Schreier, P.; Krämer, G.; Brückner, H. *Brauwissenschaft* 33 (7) 165-174; (8) 200-204 (1980) [83 ref. De, en, fr] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Adsorption and GLC-MS methods were used in qualitative and quantitative studies on odour-active compounds released during wort boiling. Trials were conducted to evaluate the efficiency of an odour-elimination unit comprising condenser, counter-current scrubber and residual vapour vessel with spray nozzles. Polar, water-soluble compounds are separated in the condensate, whereas 67-69% of the non-polar constituents remain in the residual vapour, the main constituent being terpene hydrocarbons from hops (mainly myrcene). Water sprays in the residual vapour vessel had little effect; addition of surface active materials to the spray water reduced concn. of non-water soluble odour compounds by 6-7%. Practical studies on wort coppers in breweries showed that condenser systems permit heat recovery, but have little effect on release of odour compounds. TUB-IGB

22

[Method of determining the aroma compounds in beverages.]

Avakyants, S. P.; Saenko, N. I. (Union of Soviet Socialist Republics, Vsesoyuznyi Zaochnyi Institut Pishchevoi Promyshlennosti)
USSR Patent 709 996 (1980) [Ru]

An improved accuracy gas chromatographic technique employs a vapour phase obtained by evaporating a test sample at 80-120°C and a low residual pressure. W&Co

23

Volatile constituents of litchi (*Litchi chinensis* Sonn.).

Johnston, J. C.; Welch, R. C.; Hunter, G. L. K.
Journal of Agricultural and Food Chemistry 28 (4) 859-861 (1980) [7 ref. En] [Corporate Res. & Development Dep., Coca-Cola Co., Atlanta, Georgia 30301, USA]

The volatile constituents of litchi were investigated by the combined technique of GLC-MS with 42 components identified and confirmed. Of these, β -phenethyl alcohol, its derivatives, and terpenoids comprised the major portion of the volatiles. An additional compound with a mass spectral pattern typical of organosilicon compounds was detected but not identified. AS

24

Application and characteristics of polymer adsorption method used to analyze flavor volatiles from peanuts.

Buckholz, L. L., Jr.; Withycombe, D. A.; Daun, H.
Journal of Agricultural and Food Chemistry 28 (4) 760-765 (1980) [13 ref. En] [Int. Flavors & Fragrances, Union Beach, New Jersey 07735, USA]

A method was employed for collection, characterization, and quantitation of headspace volatiles from roasted peanuts using Tenax GC adsorption polymer. 2 types of peanuts and 3 roasting conditions were used in the experiment. Collection time was 4 h, using 400 g of peanuts in a jacketed glass column held at 50°C. Volatiles were swept by N₂ into a 3 mm diam. glass trap packed with Tenax GC polymer. The trap was then inserted directly into the modified injection port of a gas chromatograph (GC) equipped with a flame ionization detector. Peaks were

quantitated by a computing integrator, using an internal standard. Statistical analysis showed good reproducibility among runs as evidenced by the coeff. of variability which averaged 3.5%. Analysis of variance confirmed differences among roasting conditions. Conditions were established for the collection and transfer to a GC of aroma/flavour volatiles of roasted peanuts in proportions closely approaching their natural occurrence. AS

25

Identification of volatile constituents responsible for characteristic molasses aroma by unconventional gas chromatography.

Godshall, M. A.; Roberts, E. J.; Legendre, M. G.
Journal of Agricultural and Food Chemistry 28 (4) 856-858 (1980) [18 ref. En] [Cane Sugar Refining Res. Project, Inc., PO Box 19687, New Orleans, Louisiana 70179, USA]

An external sample inlet device was used for direct sampling of volatiles in molasses for GLC analysis, thus removing the need for solvent extraction or similar steps. A glass rod is coated with 100-300 mg molasses, the coated rod is wrapped with volatile-free glass wool and placed in the sample inlet device. The assembly is heated to 135-145°C for 12-30 min, and volatiles are swept onto the main GLC column (Tenax GC 35/60 mesh coated with 6% poly-MPE) with He; the head of the GLC column is maintained at 30°C for this stage. After sample collection, volatiles are separated by temp. programming from 30° to 210°C at 4°C/min. Peaks were identified by retention time, peak enhancement by addition of standard to sample, MS, and sensory evaluation at the elution port. 23 of the 27 peaks obtained were identified, some for the 1st time in molasses. Dimethyl sulphide was identified as a major contributor to molasses aroma. DIH

26

The effect of pyruvate on the production of flavour compounds by *Lactobacillus casei* ATCC 7469.

Cardenas, I. L. B. de; Ruiz Holgado, A. P. de; Oliver, G.
Milchwissenschaft 35 (5) 296-300 (1980) [15 ref. En, de] [Inst. de Microbiol., Univ. Nacional de Tucuman, Ayacucho, Argentina]

The ability of 4 strains of lactobacilli (*L. casei* ATCC 7469, *L. fermentum* ATCC 9338, *L. brevis* ATCC 14869 and *L. acidophilus* CNRZ 232) to use sodium pyruvate as sole source of carbon was examined. Addition of 0.5% pyruvate to a medium containing 10 g yeast extract, 15 g peptone, 10 g tryptone and 1 ml Tween 80/l resulted in increased growth of *L. casei*, *L. acidophilus* and *L. brevis*, but not of *L. fermentum*. Higher concn. of pyruvate were inhibitory to all 4 strains. Induction of the pyruvate decarboxylase system in *L. casei* cells was studied by measuring acetoin and diacetyl production after incubation of the *L. casei* cells in media of different compositions. Results indicated that the biosynthesis of diacetyl from pyruvate was constitutive and that the synthesis of acetoin via α -acetolactate was induced by pyruvate. These findings suggest that addition of pyruvate to natural milk fermentations could be used to enhance flavour production. MEG

27

Separation and identification of odor in oxidized sardine oil.

Nakamura, K.; Iida, H.; Tokunaga, T.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 46 (3) 355-360 (1980) [13 ref. En] [Tokai Regional Fisheries Res. Lab., 5-5-1, Kachidoki, Chuo-ku, Tokyo 104, Japan]

Volatile components of artificially oxidized sardine oil were analysed for volatile fatty acids and carbonyl compounds using gas chromatographic techniques. The odour of the oil was also directly analysed using a liquid oxygen cold trap for the volatiles and gas chromatography-MS analysis. 43 compounds were identified by means of these methods. Unlike vegetable oils, the odour in rancid sardine oil was found to be due mainly to low mol. wt. volatile compounds, predominantly ethanal, propanal and propionic acid. In addition, pent-1-en-3-ol, ethanol, acetic acid, butanal, pentenal and similar substances also contributed to the odour. Using the cold trap method, it was found that alcohols, hydrocarbons and other substances usually difficult to detect with other methods were easily identified. JRR

28

[Volatile components of smoked salmon. I.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 45 (12) 1543-1545 (1979) [2 ref. Ja, en] [Notre Dame Seishin Univ., Okayama 700, Japan]

Volatile components of smoked salmon were studied by GLC and GC-MS analysis. 16 phenols, 17 acids, an ester, an alcohol and 3 hydrocarbons were identified. Phenols such as guaiacol, 4-methylguaiacol, 4-ethylguaiacol, 2,6-dimethoxyphenol and 4-methyl-2,6-dimethoxyphenol were presumed to be the principle components of aroma of smoked salmon. AS

29

[Volatile components of smoked salmon. II. The relationship between flavours of smoked salmon and smoke-tar.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 45 (12) 1547-1549 (1979) [1 ref. Ja, en] [Notre Dame Seishin Univ., Okayama 700, Japan]

In order to observe the influence of smoke-process on smoked salmon flavour, volatiles of salt salmon and smoke-tar were studied by GC-MS analysis. 16 volatile components (14 acids and 2 hydrocarbons) from salt salmon and 32 volatile components (15 acids, 16 phenols and an ester) from smoke-tar were identified. Phenols found in the smoked salmon aroma were shown to arise in the smoke-process. [See preceding abstr. for part I.] AS

30

The analysis of radiolysis products in meat and meat substances. [Review]

Merritt, C., Jr.

Food Irradiation Information No. 10, 20-33; 7 (1980) [24 ref. En, fr] [US Army Res. & Dev. Command, Natick, Massachusetts 01760, USA]

This review describes previously published methods for the separation and identification of volatile radiolysis products (high vacuum distillation + MS-GLC), and the separation of less volatile compounds (solvent extraction + size exclusion chromatography + liquid or GLC + MS). Some of the less volatile

compounds identified are discussed. Some primary radiolysis products from beef fat, and volatile compounds isolated from meat substances are shown in tables; the effects of fat content in beef, irradiation temp. and dose on the amounts and relative amounts of various radiolysis products formed are shown in diagrams. Computer printouts of analytical data from the wholesomeness study of irradiated beef (up to 15 months' storage), and a control chart of data for the amount of n-heptane obtained from ^{60}Co and electron irradiated beef as a function of storage time are reproduced. Data for samples irradiated at 3.7 Mrad with ^{60}Co or in the linear accelerator (LINAC) showed that the amount of n-heptane (and other radiolysis products) is essentially the same for γ - or LINAC irradiation. Statistical analysis of the data showed little variation in amounts of radiolysis products under given irradiation conditions, and no change during long-term storage. RM

31

Mass spectral characterization of 2,4-disubstituted 1,3-dioxolanes found in flavors.

Welch, R. C.; Hunter, G. L. K.

Journal of Agricultural and Food Chemistry 28 (4) 870-872 (1980) [3 ref. En] [Corporate Res. & Development, Coca Cola Co., Atlanta, Georgia 30301, USA]

A number of 2,4-disubstituted-1,3-dioxolanes, only a few of which are approved for food use, were found in commercial flavours. These compounds can be readily characterized by MS. The mass spectra of the acetals of the more common flavouring aldehydes are presented here for the first time. AS

32

Continuous desorption apparatus for aroma flavor concentrate.

Strobel, R. G. K. (Procter & Gamble Co.)

United States Patent 4 204 464 (1980) [En]

An invention is described which includes a process and apparatus for the production of an aroma flavour concentrate from aroma and flavour-bearing substrates, specifically roasted and ground coffee. The invention involves a process for continuously de-aromatizing and desorbing aroma and flavour constituents from the substrates by passing wet steam counter-currently through a continuous columnar bed of the substrate flowing upwards through an upright vacuum-tight desorption column. RAW

33

Changes in lysozyme due to reactions with volatile products of peroxidizing methyl linoleate.

Funes, J.; Yong, S.; Karel, M.

Journal of Agricultural and Food Chemistry 28 (4) 794-798 (1980) [29 ref. En] [Dep. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, Massachusetts 02139, USA]

Previous studies have shown that lysozyme [used as a model food protein] undergoes polymerization, loss of biological activity, and other deteriorative changes when exposed to incubation in air with methyl linoleate in a freeze-dried model system. Similar effects can be achieved by exposing protein to the headspace over peroxidizing methyl linoleate or to vapours of the volatile products of linoleate peroxidation, 2,4-decadienal, n-hexanal, and 2-heptenal. Changes in solubility, enzymic activity, and polymer formation were studied. It is also shown, through the use of electron spin resonance (ESR), that volatile reaction products generate protein-centered free radicals when lysozyme is exposed to these products by being incubated over oxidizing linoleate. Water activity had a significant effect on the volatile-initiated changes in the protein. Cross-linking, loss of enzyme activity, and insolubilization increased with increasing water activity. ESR signal intensity was greatly diminished at high water activity, probably because of rapid recombination of free radicals. AS

34

[New methods for evaluation and analysis of organoleptic qualities of foods and for prediction of their changes. XII. Quantitative analysis of diacetyl and vanillin and determination of their distribution coefficient in water-oil mixtures by means of subjective olfactometry.] Neue Methoden der Be- und Auswertung sensorischer Eigenschaften von Lebensmitteln und der Berechnung ihrer Veränderungen. XII. Die quantitative Analyse von Diacetyl und Vanillin und die Bestimmung ihrer Verteilungskoeffizienten mit Hilfe der 'Subjektiven Olfaktometrie' in Wasser-Öl-Gemengen. Herrmann, J.; Abd-El-Salam, I.

Nahrung 24 (3) 273-283 (1980) [19 ref. De, en, ru] [Sektion Nahrungsgüterwirtschaft & Lebensmitteltech., Humboldt-Univ., Berlin]

The basic principles of the 'subjective olfactometry' technique, devised by the authors, are discussed; over a specified range, odour intensity is closely related to aroma material concn. Using vanillin and diacetyl in oil, water or oil/water emulsions as examples, it is shown that the partition coeff. (important for the aroma intensity in different substrates) may be determined on the basis of odour intensity, even for substances of unknown structure. [See FSTA (1978) 10 9A532 for part XI, and following abstr. for part XIII.] IN

35

[New methods for evaluation and analysis of organoleptic qualities of foodstuffs and for prediction of their changes. XIII. The estimation of the odour perception values of pure aroma substances and of their solutions as a method for determining their vapour pressures.] Neue Methoden der Be- und Auswertung sensorischer Eigenschaften von Lebensmitteln und der Berechnung ihrer Veränderungen. XIII. Die Ermittlung der Geruchsintensität reiner Aromastoffe sowie deren Lösungen als Methode zur Bestimmung ihrer Dampfdrücke. Herrmann, J.; Kiener, W.; Abd-El-Salam, I.

Nahrung 24 (4/5) 389-397 (1980) [9 ref. De, en, ru] [Sektion Nahrungsgüterwirtschaft & Lebensmitteltech., Humboldt-Univ., Berlin]

The use of an odorimeter for determining the odour perception values of air-diluted gas mixtures which are in equilibrium with aqueous vanillin and diacetyl solutions is described. For diacetyl, the slope of the linear representation of the power function of the perception values is twice that observed for values obtained by smelling diacetyl solutions of varying concn. This fact may be explained by positive deviations from Raoult's law. Because the perception values depend directly on the vapour pressures, but only indirectly on the diacetyl concn. in the solutions, the power function of Stevens is valid only for the dependence of the vapour pressures; it is not valid for the dependence of the concn., which can be expressed by an exponential function. Vanillin does not show these deviations. It was found that aroma intensity is dependent on the medium; vapour pressure of the aroma compound is of greater significance than its concn. in the solution. [See preceding abstr. for part XII.] IN

36

Methods in high resolution gas chromatography. Two-dimensional technique. Bertsch, W.

Journal of High Resolution Chromatography and Chromatography Communications 1 (6) 289-299 (1978) [77 ref. En] [Univ. of Alabama, Tuscaloosa, Alabama 35401, USA]

Basic methodology to effect the separation of complex samples by GLC is discussed from an experimental point of view. Several possibilities are presented, commonly used to increase information provided by GLC, e.g. incorporation of several sets of retention data, multiple detectors, column switching (multidimensional techniques). An attempt is made to define 2-dimensional GLC; available techniques and instrumentation are discussed with specific examples. The technique should be useful for flavour and trace analysis, e.g. in the food industry. RM

37

Deterioration of food proteins by binding unwanted compounds such as flavors, lipids and pigments. [Lecture]

Arai, S.

ACS Symposium Series 123, 195-209 (1980) [69 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Bunkyo-ku, Tokyo 113, Japan]

Some of the undesirable effects resulting from the interaction of proteins with flavours (e.g. in cheese, protein concentrates, soy protein), with lipids (e.g. in soy protein, soy milk) and with naturally occurring pigments and related compounds, including phenolic compounds (e.g. in extraction of proteins from green leaves and algae) are reviewed. Examples given suggest caution in the use of some proteins for food. [See FSTA (1981) 13 3A110.] AL

38

[Qualitative analysis of wines by head space technique.]

Bertuccioli, M.

Industria delle Bevande 10 (1) 42-54 (1980) [92 ref. It, fr, en]

Head space analysis of wines is described with details of methods and applications. Chromatograms and tables illustrate its application to characterization of musts and wines, definition of grape maturity index, evaluation of technological influences (mechanical harvesting, winemaking method - traditional or with low-temp. maceration), ageing, correlation of sensory and instrumental analysis, and residue analysis with special reference to container residues (styrene monomer). RM

39

Investigations of the biosynthesis of certain γ -substituted- γ -butyrolactones present in wine.

Fagan, G. L.

Dissertation Abstracts International, B 40 (10) 4769-4770: Order no. 80-09493, 195pp. (1980) [En] [Univ. of California, Davis, California 95616, USA]

Studies were made of the biosynthetic origin of (i) γ -butyrolactone, (ii) γ -ethoxy- γ -butyrolactone, (iii) 4-hydroxy-5-ketohexanoic acid γ -lactone and 2 optically active diastereomers of (iv) 4,5-dihydroxyhexanoic acid γ -lactone. All these compounds have been previously found in wine and it has been postulated that they are synthesized by yeast from 4-oxobutyric acid. The studies indicated that yeast cultures inoculated with ethyl 4-oxobutyrate (1 ml/l) contained after 6 wk enhanced amounts of (i), (iii) and (iv). In addition, radioactive (i) and (iii) were isolated from yeast cultures inoculated with ethyl 4-oxobutyrate-2- 14 C. Naturally occurring (iii) was isolated in a sufficient quantity to demonstrate that it is optically active. 2 previously undetected compounds, 4-hydroxy-5-ketoheptanoic acid β -lactone and a 4,5-dihydroxy acid γ -lactone of unknown structure, were identified in Palomino sherry. Further studies involved the synthesis and characterization of 6 different 5-alkoxydihydro-2 (3H)-furanones by photo-oxidation of 2-furaldehyde. 64 compounds were identified, by means of their gas chromatographic retention indices and mass spectral data, in sherry; many had not previously been found in sherry. JA

40

Volatile ester hydrolysis or formation during storage of model solutions and wines.

Ramey, D. D.; Ough, C. S.

Journal of Agricultural and Food Chemistry 28 (5) 928-934 (1980) [24 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

Effects of temp., ethanol concn. and pH on the rate of hydrolysis of common volatile esters of wine (ethyl butanoate, ethyl hexanoate, ethyl octanoate, ethyl decanoate, isobutyl acetate, isoamyl acetate, hexyl acetate, and 2-phenylethyl acetate) were investigated in model situations. The pseudo-1st-order rate constants for temp. and pH effects were calculated as well as the 2nd-order rate constants for $[H^+]$ effect on model solution ester hydrolysis. The effect of acid catalysis of

species other than H^+ was calculated and found to be minor. Ethanol concn. differences in amounts of 10-14% v/v had little effect on the rates. Activation energies and thermodynamic activation constants were calculated for the esters. Several wines were also analysed for changes in ester concn. with time at several different temp. AS

41

The aroma of Finnish wild raspberries, *Rubus idaeus*, L.

Honkanen, E.; Pyysalo, T.; Hirvi, T.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 171 (3) 180-182 (1980) [20 ref. En, de]

[Tech. Res. Cent. of Finland, Food Res. Lab., Biol. 1, SF-02150 Espoo 15, Finland]

Volatile components of fresh wild raspberries were studied by combined gas chromatography-MS. 75 components were identified, corresponding to about 64 p.p.m. of raspberry oil in the press juice. More than 40 compounds not reported previously as raspberry volatiles were detected. These included 5-methyl-4-hydroxy-3(2H)furanone, 2,5-dimethyl-4-hydroxy-3(2H)furanone, 2,5-dimethyl-4-methoxy-3(2H)furanone, and 11 terpenes. Two of the identified esters, ethyl 5-hydroxyoctanoate and ethyl 5-hydroxydecanoate, have not previously been identified in natural products. These esters are very unstable, forming the corresponding δ -lactones during processing of the berries. AS

42

Glucosinolates of *Lepidium sativum* and 'garden cress'.

Gil, V.; MacLeod, A. J.

Journal of the Science of Food and Agriculture 31 (7) 739-741 (1980) [7 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Campden Hill Road, London W8 7AH, UK]

Volatile aroma compounds of (i) authentic salad cress (*Lepidium sativum*) and (ii) retail samples of salad cress were analysed by GLC-MS. Tables of data are given for the % relative abundance of individual components. Predominant constituents were (%): (i) benzaldehyde 15, benzyl alcohol 13, phenylacetonitrile 62, 3-phenylpropionitrile 2 and benzyl isothiocyanate 7; and (ii) benzaldehyde 6, benzyl alcohol 4, 2-phenylethanol 35, phenylacetonitrile 7, 3-phenylpropionitrile 15 and 2-phenethyl isothiocyanate 31. 2-phenylethanol and 2-phenethyl isothiocyanate, which were major components in (ii), were absent in (i); benzyl isothiocyanate was absent in (ii). On the basis of these results, it is suggested that (ii) does not contain solely *L. sativum*, but also other cruciferous seedlings. The sample analysed in this study was certainly free of *Brassica napus*, as glucosinolates characteristic of this species were absent. AJDW

43

[Identification of p-dichlorobenzene from the volatile compounds of unusual-smelling beef.]

Yaneda, Y.; Tsuda, K.

Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 20 (6) 411-417 (1979)

[31 ref. Ja, en] [Inst. Public Meat Hygiene, Toyama, Zeshima, Fuchu-machi, Nei-gun, Toyama, Japan]

The volatile compounds of unusual-smelling raw beef were analysed. The volatile compounds were steam-distilled from the sample, and collected. One volatile compound which contributed to the unusual smell was identified as *p*-dichlorobenzene, by GLC and GLC-MS. In unusual-smelling beef, *p*-dichlorobenzene was found over the concn. range 4–56 p.p.m. in the muscle and at 165 p.p.m. in the perirenal fat, as compared to traces to 0.1 p.p.m. in normal beef. TM

44

Glass capillary gas chromatography for quantitative determination of volatile constituents in cold-pressed grapefruit oil.

Wilson, C. W., III; Shaw, P. E.

Journal of Agricultural and Food Chemistry 28 (5) 919–922 (1980) [15 ref. En] [US Citrus & Subtropical Products Lab., USDA, Winter Haven, Florida 33880, USA]

32 components of Florida cold-pressed grapefruit oil were separated on a 30-m glass capillary column coated with Carbowax 20M. They were quantitated on the basis of both normalization and internal standard methods by use of a microprocessor-controlled GLC terminal. Compounds not previously quantitated for grapefruit oil were β -pinene, *cis*- and *trans*-limonene oxides, citronellyl acetate, octanol, humulene, and carvone. Knowledge of their presence is important, since their individual contributions to the overall flavour profile of grapefruit oil can then be determined. AS

45

Interactions of flavour compounds in model food systems. [Thesis; (1978), 115pp., En, ISBN 3-260-04487-6]

King, B.

Dissertation Abstracts International, C 39 (3) 421 (1979) [En] [Eidg. Tech. Hochschule, Zürich, Switzerland]

A method was developed to study the interactions between flavour compounds and denatured proteins in various media. These interactions can be described as reversible adsorption of the former on the latter, probably by an equilibrium-type mechanism. Adsorption was independent of temp., pH and ionic strength of the medium. In the concn. range examined, adsorption was directly proportional to the amount of protein and increased linearly with increasing ligand concn. The kind of protein used and the way in which it is prepared influence its adsorption less than the fact that it is denatured. Complexes of native bovine serum albumin made with emulsifiers, fatty acids or butter and heat denatured adsorbed ligand to the same extent as, if not more than, the corresponding amount of pure denatured protein. Suspending denatured protein in media containing casein hydrolysate did not affect the amount of ligand adsorbed by the denatured protein. Sodium caseinate, however, slightly decreased adsorption. Denatured protein suspended in oil/water emulsions containing casein showed approx. 50% less adsorption than buffer suspensions of the protein. Likewise, reconstituted non-dairy milk powders such as coffee whiteners, as well as milk, milk drink and coffee

cream reduced adsorption to denatured proteins suspended in them by approx. 50%. It is suggested that the combination of casein and lipid in the suspending media creates surfaces which interact with flavour compounds, thus competing with the denatured protein and shifting the equilibrium away from it. These surfaces correspond to the lipoprotein membranes found in natural foods. Their absence could explain the difficulty encountered in flavouring synthetic foods. AS

46

Odour evaluation, fraction collection and preparative scale separations with glass capillary columns.

Sandra, P.; Saeed, T.; Redant, G.; Godefroot, M.; Verstaeppe, M.; Verzele, M.

Journal of High Resolution Chromatography and Chromatography Communications 3 (3) 107–114 (1980) [23 ref. En] [State Univ. of Ghent, Krijgslaan, 271 (S4), B-9000 Ghent, Belgium]

A simple but effective gas chromatographic approach to odour evaluation and fraction collection with capillary columns is described. An all-glass device splits the columns effluent, with one splitter arm going to a flame ionization detector. For odour evaluation, the other splitter arm is led via teflon tubing to the nose. Off-line heart-cutting is carried out by collecting the split effluent on a glass capillary microtrap, the inner walls of which are coated with OV-101. This allows recovery of ng amounts of material. Multipass operation or repeated collection leads to preparative capillary GLC for further spectroscopic investigation. These techniques do not involve sophisticated equipment or valves. Applications of this type of smell analysis, heart-cutting and enrichment in the analysis of black pepper essential oil and hop essential oil are presented. AS

47

Head space gas chromatography with glass capillaries using an automatic electropneumatic dosing system.

Kolb, B.; Pospisil, P.; Borath, T.; Auer, M.

Journal of High Resolution Chromatography and Chromatography Communications 2 (6) 283–287 (1979) [11 ref. En] [Bodenseewerk Perkin-Elmer & Co. GmbH, D-7770 Überlingen, Federal Republic of Germany]

Headspace GLC using a special electropneumatic sampling system works well in combination with glass capillaries. Because a homogeneous gas mixture is already present, most problems inherent with inlet splitters are avoided. In cases where high vapour pressure of the sample can cause problems with the pressure-controlled sampling system, narrow bore glass capillaries provide the necessary inlet pressure. Applications, including headspace analysis of coffee aroma, are shown. RM

48

Temporarily immobilized microorganisms: rapid measurements using a mass spectrometer.

Weaver, J. C.; Perley, C. R.; Reames, F. M.; Cooney, C. L. *Biotechnology Letters* 2 (3) 133-137 (1980) [11 ref. En] [Dep. of Nutr. & Food Sci., Massachusetts Inst. of Tech., Cambridge, Massachusetts 02139, USA]

Microorganisms were temporarily and reversibly immobilized by entrapment within a small vol. A membrane interface to a mass spectrometer, located downstream from the immobilized microorganisms, allowed direct and continuous measurement of dissolved volatile metabolites. It was applied to measuring anaerobic responses of *Saccharomyces cerevisiae* to glucose and fructose. RM

49

The determination of flavor retention and native volatiles in pre-extrusion flavored textured soy protein.

Palkert, P. E.

Dissertation Abstracts International, B 40 (12) 5598-5599; Order no. 80-12631, 201 pp. (1980) [En] [Univ. of Massachusetts, Amherst, Massachusetts 01002, USA]

The purpose of the study was to determine means of imparting a meat-like flavour to pre-extrusion flavoured textured soy protein (TSP). The most effective pre-extrusion flavorants for TSP were found to be synthetic meat flavours, followed by beef tallow. An isolation method using a Tenax porous polymer trap was capable of rapidly and reproducibly isolating and quantitating a model meat flavour system from rehydrated TSP. Recovery of pre-extrusion added model flavour compounds from TSP after extrusion ranged widely for different compounds and extrusion conditions, e.g. recovery ranged from 4% for undecanal and butyl disulphide to 22% for 2,4-dimethyl thiazole. Interacting the model flavour system with soy flour in the presence of water slightly increased the retention of the model system. Reduction of the moisture content of TSP from 10 to 3.5% resulted in little loss of flavour compounds, except for furfural. Ingredients used as flavour retainers had a variable effect on flavour retention; some (e.g. corn oil, casein, zein, potato starch) increased flavour retention while others had no effect or decreased it. A direct relationship was found between protein hydrophobicity and flavour retention during extrusion. GLC-MS analysis of native TSP volatiles revealed nearly 150 compounds of which 60 were identified; of particular interest was the apparent isolation of a trithiepane, the first report of this compound in food. JA

50

Gas chromatographic column for the rapid determination of congeners in potable spirits.

Corcia, A. di; Samperi, R.; Severini, C.

Journal of Chromatography 198 (3) 347-353 (1980) [9 ref. En] [Istituto di Chimica Analitica, Univ. di Roma, 00185 Rome, Italy]

Detr. of minor components, including fatty acids, in potable spirits has been accomplished by using acid-washed (AW) Carbopack B, an example of graphitized carbon black, modified with PEG 20M. Quantitative data for selected compounds show that good precision can be obtained even at the level of a few p.p.m. Detn. of minor components in a commercial sample of Scotch whisky was carried out using AW Carbopack B modified with 6.6% PEG 20M. Components present in concn. of about 0.5 p.p.m. can be determined with a precision of about 30%. An additional column packing (AW Carbopack B + 3.35% PEG 20M) was used for determining those few components of minor interest which cannot be separated by the former column packing. AS

51

Volatile sulfur compounds in fresh orange and grapefruit juices: identification, quantitation, and possible importance to juice flavor.

Shaw, P. E.; Ammons, J. M.; Braman, R. S.

Journal of Agricultural and Food Chemistry 28 (4) 778-781 (1980) [16 ref. En] [US Citrus & Subtropical Products Lab., S. Reg., USDA, Winter Haven, Florida 33880, USA]

A sensitive method for detecting volatile S compounds was used to determine S compounds in vapours above orange and grapefruit juices. H_2S and methyl sulphide were found in all samples; SO_2 , COS, methane thiol, and some higher alkyl sulphides were detected in some. Of all these, only H_2S has been reported as a constituent of orange and grapefruit juices. Since H_2S and methyl sulphide were found in the parts-per-billion concn. range, levels which are above their reported aroma thresholds in air, they probably contribute to the flavour of fresh orange and grapefruit juice. AS

52

Wine aroma composition: identification of additional volatile constituents of red wine.

Schreier, P.

Journal of Agricultural and Food Chemistry 28 (5) 926-928 (1980) [37 ref. En] [Inst. für Lebensmitteltech. & Analytische Chemie der Tech. Univ. München, D-8050 Freising-Weißenstephan, Federal Republic of Germany]

11 additional components not previously identified in wine volatiles were characterized from an oxygen-rich fraction of the aroma extracts obtained by liquid-liquid extraction of Burgundy Pinot Noir red wines. The compounds identified by coupled GLC-MS were ethoxy and acetyloxy derivatives of hydroxy ketones and hydroxy esters: 3-ethoxy-2-butanone, 3-ethoxy-2-pentanone, 3-acetyloxy-2-butanone, ethyl 2-acetyloxyacetate, ethyl 2-acetyloxypropanoate, ethyl 3-acetyloxybutanoate, ethyl 4-acetyloxybutanoate, 3-methylbutyl 4-acetyloxybutanoate, ethyl 2-acetyloxy-3-methylbutanoate, ethyl 2-acetyloxy-4-methylpentanoate, and diethyl 2-acetyloxysuccinate. AS

53

[Determination of glycerol and 2,3-butanediol in wines by gas-solid chromatography (GSC).]
 Spagna Musso, S.; Mincione, B.; Coppola, V.
Rivista di Viticoltura e di Enologia 32 (2) 47-64 (1979)
 [18 ref. It, fr] [Istituto di Ind. Agrarie dell'Univ. di Napoli, Naples, Italy]

A rapid GSC method for simultaneous detn. of glycerol and 2,3-butanediol in wines is described. Interference from ethanol is avoided by removing it from samples at $\leq 50^\circ\text{C}$ in a rotary evaporator. 1,4-butanediol is added as an internal standard and samples are chromatographed on Chromosorb 101 (80-100 mesh) at a column temp. of 250°C ; a flame ionization detector is used. Analysis takes approx. 15 min and gives good accuracy and reproducibility. Tabulated data give a detailed comparison of the GSC method with volumetric methods. The method was applied to 89 samples of commercial wines; means and ranges found were as follows: glycerol 5.89 (3.26-12.40) g/l in white wines, 6.77 (4.16-10.37) g/l in red wines; 2,3-butanediol 603 (291-1318) mg/l in white wines, 514 (184-864) mg/l in red wines. Results of the 89 detn. are tabulated in full, as is chemical composition of all wines analysed. DIH

54

Orange juice flavor: contribution of certain volatile components as evaluated by sensory panels.

[Lecture]

Shaw, P. E.; Ahmed, E. M.; Dennison, R. A.
Proceedings of the International Society of Citriculture pp. 804-807 (1977) [22 ref. En] [US Citrus & Subtropical Products Lab., Winter Haven, Florida 33880, USA]

Odour and flavour thresholds were determined for 29 orange juice components believed to contribute to orange flavour. For most components no significant differences were found between odour and flavour thresholds. Selected compounds added, at levels normally found in juice, to a bland orange juice base, were evaluated singly and in combination for their contribution to orange flavour. Several mixtures of 3-5 components contributed flavour that approached the flavour of good quality commercial orange juice. A few compounds, decanal, *trans*-2-hexenal, and 1-penten-3-one detracted from flavour when added either singly or in combination with other components. These studies indicate that mixtures of certain volatiles from orange juice could contribute acceptable orange flavour to a bland orange juice base. [See FSTA (1981) 13 4]486.] AS

55

Recovery and concentration of citrus aroma.

[Lecture]

Mannheim, C. H.; Passy, N.
Proceedings of the International Society of Citriculture pp. 756-762 (1977) [41 ref. En] [Dep. of Food Eng. & Biotech., Israel Inst. of Tech., Haifa, Israel]

Volatiles responsible for citrus aroma are largely lost on juice concn. so recovery and reincorporation into the concentrate are necessary. This paper surveys aroma recovery systems including absorption and compression of volatiles in liquid-sealed vacuum pumps, the Florida citrus commission process, the Cook process, the Kelly aroma recovery system, the APV partial condensation fractionation essence recovery process and liquid CO_2 extraction. Aroma retention during concn. involves selective removal of water by one of several ways, such as freeze-concn. and ice crystal separation, membrane processing or centrifugal pulp/serum separation with subsequent pulp combing for aromatics. Essence analysis by GLC, chemical and sensory methods is considered in relation to essence stability on storage. To obtain a good quality reconstituted product, addition of an aroma fraction to the concentrate is necessary, but careful balancing of components and prevention of deterioration is vital. [See FSTA (1981) 13 4]486.] LH

56

The role of volatiles in storage of citrus fruits.

[Lecture]

Norman, S. M.
Proceedings of the International Society of Citriculture pp. 238-242 (1977) [24 ref. En] [Fruit & Vegetable Chem. Lab., ARS, USDA, 263 South Chester Avenue, Pasadena, California 91106, USA]

Investigations of volatiles important to the quality evaluation of fresh citrus fruit during storage, marketing, and senescence are reviewed. The rates at which acetaldehyde, ethanol, methanol, and ethyl acetate are emanated from intact citrus differ in air and N_2 . The internal ethanol and acetaldehyde contents of citrus vary with degree of maturity and cv., thickness of wax coatings, and length and temp. of storage. The concn. of citrus oil gland constituents are related to degree of senescence, desiccation, oleocellosis, and the presence of decay organisms. Citrus fruit may absorb odours during storage and become off-flavoured. Some naturally occurring citrus volatiles, such as acetaldehyde and octanal, are effective fungicides. [See FSTA (1981) 13 4]486.] AS

57

Chemicophysical aspects of dark semi-sweet and milk chocolate during conching.

Hoskin, J. M.

Dissertation Abstracts International, B 41 (1) 122:
 Order no. 80-15803, 176pp. (1980) [En] [Pennsylvania State Univ., University Park, Pennsylvania 16802, USA]

Samples of dark semi-sweet chocolate processed in 4 different conches were obtained at pre-selected times during conching and analysed for volatile fatty acids (VFA). Dark and milk chocolate formulated and processed commercially was also analysed. The VFA were recovered by an extraction column and steam distillation procedure and quantified by GLC utilizing electronic integration. Results indicated that acetic acid is the major acid in both chocolate and liquor, amounting to 95% of the total VFA (or 0.15% of the chocolate mass). Acetic and isovaleric acids were

always present in the chocolate and liquor, while propionic, butyric and isobutyric acids were sometimes present and in much lower concn. Cocoa butter contained lower VFA concn. than chocolate and liquor. Conche type affected VFA concn. in chocolate, e.g. modern conches (vertical, horizontal-rotary, rotary) generally depressed VFA concn., while older models (longitudinal conche, pug mill) had no such effect. The form in which VFA existed in chocolate also affected VFA during conching, e.g. alkalinized chocolate (in which most VFA are combined as K salts) did not show a decrease in VFA concn. during conching, while its unalkalinized counterpart did. Further studies utilized scanning electron microscopy to define the morphology of raw and roasted, unfermented and fermented cocoa beans and to determine some structural characteristics of chocolate and its ingredients before, during and after conching. JA

58

Rapid instrumental technique for the analysis of volatiles in salad dressing.

Legendre, M. G.; Dupuy, H. P.; Rayner, E. T.; Schuller, W. H.

Journal of the American Oil Chemists' Society 57 (10) 361-362 (1980) [8 ref. En] [S. Reg. Res. Cent., PO Box 19687, New Orleans, Louisiana 70179, USA]

The GC-MS method of Legendre et al. [FSTA (1979) 11 11A800] was used to analyse volatile compounds in garlic French dressing stored for 0, 6 and 12 months. Effects of storage time on 17 such compounds are shown as chromatograms. The method is considered to give a precise, reproducible, objective assessment of the flavour characteristics. HBr

59

[Miltitz reports on essential oils, odour compounds, etc.] Miltitzer Berichte über ätherische Öle, Riechstoffe usw. [Book]

Horn, A. (Editor)

288pp. (1977) (publ. 1979) [many ref. De] German Democratic Republic; VEB Chemisches Kombinat Miltitz

This collation of published information includes the following sections: essential oils (pp. 7-62); constituents of essential oils and odour compounds (pp. 63-210); aroma and flavour compounds (pp. 211-243); miscellaneous (aflatoxins, review articles, chemotaxonomy, enzymes, odour thresholds, insecticides, natural components, pharmacological properties, pheromones, physiological properties, odour Codex, moulds, sensory analysis) (pp. 244-254). RM

60

[Antioxidant activity and pungency of synthetic capsaicin homologues.]

Fujimoto, K.; Kanno, Y.; Kaneda, T.

Journal of Japan Oil Chemists' Society [Yukagaku] 29 (6) 419-422 (1980) [15 ref. Ja, en] [Fac. of Agric., Tohoku Univ., Sendai, Japan]

Capsaicin, the pungent principle of red pepper, is a *N*-vanillylamide whose pungency depends on the chain length of the fatty acid moiety. Following earlier demonstration of its antioxidant effect, synthetic *N*-vanillylamides of saturated C12 to C22 fatty acids were prepared and their pungency and antioxidant activity determined. Results showed that pungency decreases with increasing fatty acid chain length (i.e. the C9 amide was 100 times as pungent as the C14 and 1000 times as pungent as the C18 amide); the antioxidant effect of all synthetic *N*-vanillylamides on the methyl ester of safflower oil was almost equal to that of the natural pungent mixture extracted from red pepper. The antioxidant effect of 0.02 mol/kg of synthetic amides was equivalent to that of 0.02% butylated hydroxytoluene, with no detectable pungency even for the C12 amide. [From En summ.] RM

61

Vapor-phase sampling.

Jennings, W. G.

Journal of High Resolution Chromatography and Chromatography Communications 2 (5) 221-224 (1979) [27 ref. En] [Univ. of California, Davis, California 95616, USA]

2 new sample preparation procedures are described that produce solvent-free extracts suitable for high-resolution GLC. One is based on Soxhlet extraction in a pressurized container that permits the use of liquid CO₂ extraction, the other uses reflux trapping with Freon 12 (difluorodichloromethane) to isolate entrained volatiles from gas streams. The methods are illustrated by chromatograms of volatiles of banana headspace and of a commercial chilli pepper preparation. RM

62

Glass 'bomb' for multiple extraction of volatile flavour components.

Anon.

Food Industries of South Africa Nov., 18 (1979) [En] [Div. of Food Chem., Nat. Food Res. Inst., Council for Sci. & Ind. Res., Pretoria 0001, South Africa]

A 2-chambered glass 'bomb' apparatus, designed for multiple extraction of volatile flavour components from food slurries and pulps, is described. The extraction process uses dichlorodifluoromethane (Freon 12) as a solvent. Liquid freon at room temp. is shaken with the food pulp or slurry for 3 h under pressure in the vessel. After cooling to -30°C (i.e. below the solvent b.p.), the extract can be decanted into a separate chamber of the apparatus whence it can be distilled back onto the food for a further extraction by keeping the food chamber cold while warming the second chamber. After successive extractions, the essence is concentrated in a flask fitted with a fractionating column; the extracts of volatiles are then usually ready for analysis. Using this technique, a 300 ml fruit pulp sample normally yields 20-50 µl of solvent-free extract. JRR

63

[Effect of flor yeast on proline.]

Farris, G. A.; Fatichenti, F.; Deiana, P.; Madau, G.
Rivista di Viticoltura e di Enologia 31 (10) 431-439
 (1980) [46 ref. It, en]

Studies were conducted to evaluate effects of fermentation by flor yeasts (5 strains each of *Saccharomyces bayanus* and *Sacc. prostoserdovii*) on the composition of must from the grape cv. Nuragus, and Vernaccia wine. Tables of data are given for the alcohol, total extract, ash and proline concn., pH, total acidity, volatile acidity, fixed acidity, ash alkalinity and alkalinity index of these samples before and after fermentation. The results show that the flor yeasts cause moderate reductions in alcohol and volatile acid concn.; all except one *Sacc. bayanus* strain reduced proline concn. to zero. It is pointed out that use of proline concn. as an index of genuineness or origin is not applicable to wines undergoing fermentation by flor yeasts. AJDW

64

[The relation between volatile constituents and organoleptic characteristics of grappa.]

Versini, G.; Margheri, G.
Vini d'Italia 21 (122) 269-277 (1979) [24 ref. It, en, fr, de] [Lab. di Analisi & di Ricerca, Istituto Agrario Provinciale, San Michele all'Adige, Trento, Italy]

GLC studies on 95 samples of grappa, made by traditional procedures in 1974-1977, revealed the presence of > 80 volatiles, mainly esters, alcohols, acids and aldehydes. Tables are given of mean values and ranges of concn. of selected volatiles in the grappa samples studied, together with literature data for their sensory threshold values. The likely contribution of individual compounds to the characteristic flavour and aroma of grappa is briefly discussed. Results for concn. of volatiles in grappa diluted from 57.3° to 44.5° alcohol and refrigerated are also presented and discussed. Treatment of a grappa extract with NaBH₄ (to eliminate aldehydes) practically eliminated the characteristic 'grappa' flavour and aroma, leaving a normal 'wine distillate' flavour and aroma. It is therefore concluded that aldehydes are of considerable importance for the organoleptic properties of grappa. AJDW

65

Flavor constituents of pouchong tea and a comparison of the aroma pattern with jasmine tea.

Yamanishi, T.; Kosuge, M.; Tokitomo, Y.; Maeda, R.
Agricultural and Biological Chemistry 44 (9) 2139-2142 (1980) [9 ref. En] [Lab. of Food Chem., Ochanomizu Univ., Tokyo 112, Japan]

Aroma constituents of the highest quality pouchong tea were characterized by GC-MS. 48 components, including 5 newly identified compounds, were characterized. GC peak area % of the main components in pouchong tea were compared with those of jasmine tea to differentiate compounds contributing

to the aroma characteristics of pouchong tea with superior floral elegant flavour. Nerolidol, jasmine lactone, methyl jasmonate, indole, benzyl cyanide and linalool oxides were found in much higher concn. in pouchong tea than in jasmine tea. These compounds seemed to contribute to the aroma characteristics of the highest quality pouchong tea. AS

66

Quantitation of potential flavoring compounds in worts and beers.

Qureshi, A. A.; Burger, W. C.; Prentice, N.
Journal of the American Society of Brewing Chemists 37 (4) 153-160 (1979) [21 ref. En] [USDA, Sci. & Education Administration, Barley & Malt Lab., 501 N. Walnut Street, Madison, Wisconsin 53705, USA]

Worts or beers sampled at 5 stages of brewing were quantitatively analysed by HPLC for purines, pyrimidines, nucleosides, nucleotides, polyphenols, and pyrazines. A commercial reverse-phase column to which clarified wort and degassed beer could be applied without prior treatment was used. 58 compounds were identified, and about 30 additional compounds were resolved. Sweet worts contained relatively low concn. of nucleotides and pyrazines and higher concn. of the nucleobases, nucleosides, and polyphenols. Boiling and hopping caused net decreases in total polyphenols. Fermentation increased the levels of uridine 5'-monophosphate (UMP), adenosine 2'-monophosphate (AMP), and 2'-UMP, and induced the formation of many pyrazines. The most abundant compounds in bottled beers were guanosine, cytidine 3'-monophosphate (CMP), 5'-AMP, 2'-UMP, methylpyrazine, catechin, and quercetin. Beers produced from Larker and blue-aleurone 6-rowed barleys had a quercetin to catechin ratio > 1; beers produced from 2-rowed or Karl-type 6-rowed barleys had a quercetin to catechin ratio of ≤ 1. AS

67

Dimethyl sulfide precursor in beer.

Hysert, D. W.; Morrison, N. M.; Weaver, R. L.
Journal of the American Society of Brewing Chemists 37 (4) 169-174 (1979) [13 ref. En] [Molson Breweries of Canada Ltd., Montreal, Quebec H2L 2R5, Canada]

A method for determining dimethyl sulphide precursor (DMSP) in bottled beer is described. The DMSP is converted to free dimethyl sulphide (DMS) by heating the degassed beer with alkali (1N) at 100°C for 1 h. Free DMS is analysed before and after this treatment by a gas chromatographic headspace technique using a flame photometric detector. Using this method, we surveyed DMSP and DMS levels in 114 commercial bottled beers from Canada, 13 from the United States of America, and 15 from Europe. These beers had mean DMSP levels of 24, 17, and 6 µg of DMS equivalents/l, resp. The ranges of individual values were 2-112, 1-45, and 0-25 µg of DMS equivalents/l, resp. The corresponding mean DMS levels and their ranges were 81, 68, and 69 µg/l and 25-154, 40-165, and 24-111 µg/l, resp. No significant correlation between DMS and DMSP concn. was

observed. First order rate constants were determined for the DMSP to DMS conversion at 70°, 85°, and 100°C. These rate constants and the energy of activation (31 kcal/mol) for the reactions derived from them support an S-methylmethioninesulphonium type of structure for DMSP. DMSP concn. rapidly decreased during storage of bottled beer at 40° and 60°C. The increases in DMS concn. that occurred during this storage did not appear to be directly related to the DMSP decreases. AS

68

[Aroma of grapes and wines.] [Review]

Gigliotti, A.

Rivista di Viticoltura e di Enologia 31 (7) 306-312 (1980) [29 ref. It, en] [Istituto Sperimentale per la Viticoltura, Conegliano, Italy]

Analysis of aroma compounds from grapes and wines is reviewed, with reference to: historical aspects; extraction of volatiles with an inert gas; extraction of volatiles by means of solvents; headspace methods; separation of wine into organic and aqueous phases by addition of salts, with consequent enrichment of aroma compounds in the organic phase; GLC analysis of volatile aroma compounds; and coupling of GLC with MS or IR spectrometry. AJDW

69

[Simultaneous GLC determination of acetaldehyde, methanol, ethyl acetate, ethyl lactate and higher alcohols in distilled alcoholic beverages.]

Gabri, G.; Salvagiotto, R.

Vini d'Italia 22 (124) 37-43 (1979) [13 ref. It, en, fr] [Lab. Ricerche Martini & Rossi SpA, Pressione, Turin, Italy]

A method for simultaneous GLC detn. of the title compounds in spirits etc. is described. Samples (diluted to 40° alcohol if necessary) are injected directly into a 2 m x 3 mm glass column packed with Carbowax C (80-100 mesh)/0.2% Carbowax 1500, using a temp. gradient increasing from 30° to 160°C at a rate of 4°C/min. A pentanol-1 internal standard is used. R_f values are given for various volatiles, including the title compounds, analysed by this method. A preliminary injection of water into the column is recommended, to avoid interactions of methanol or acetaldehyde with the column packing. Data are given for concn. of various volatiles in 11 samples of Grappa. AJDW

70

[Use of gas chromatography for study of the aroma of non-alcoholic beverages.] (In 'Zbornik prednasok zo IV. celostatneho Sympozia o aromatických látkach v pozivatínach' [see FSTA (1981) 13 5T214]) [Lecture]

Hrivnak, J.; Farkas, J.

pp. 107-111 (1979) [11 ref. Sk] [Stavebna Fak., Slovenska Vysoka Skola Tech., 801 00 Bratislava, Czechoslovakia]

Volatile aroma compounds were extracted from beverages by a stream of N₂ at 5 ml/min for 10 min absorbed on a Chromosorb 105 column; they were then

expelled from the column by heating at 150°C and collected by freezing at -60°C in a capillary. The capillary was connected to a Fractovap 2351 (Carlo Erba, Milan, Italy) chromatograph for GLC fractionation. A chromatogram showing some 100 peaks is presented for 'Vinea' beverage; comparison with a chromatogram of a standard beverage is used to check the quality of the beverage under test. SKK

71

The flavour components of plum. An investigation into the volatile components of canned plums.

Ismail, H. M. M.; Williams, A. A.; Tucknott, O. G.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 171 (4) 265-268 (1980) [12 ref. En, de] [Univ. of Bristol, Long Ashton Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

Aroma components of canned Victoria and Golden Egg plums [conditions of growth, canning etc. not stated] were isolated by headspace collection, or by atmospheric steam distillation + extraction (cv. Victoria only) and characterized by GLC-MS. Individual components were sensorily evaluated by exit port sniffing. Overall aroma of the canned plums was also assessed by sensory evaluation. Fewer compounds were identified by headspace collection than by steam distillation. 25 compounds were identified in total, with carbonyls dominating. The most abundant were benzaldehyde, 2-furaldehyde, 2-furylmethylketone and n-nonanal, with significant quantities of benzyl acetate, pentane-2,3-dione, 3-hydroxy-butan-2-one and benzyl alcohol. 5 compounds found in canned plums have not been previously found in fresh or fermented plum products: pentane-2,3-dione, carvone, 1-methoxy-4-hydroxybenzene, acetophenone and n-octyl acetate. No single component was described as smelling of fresh or cooked plums, although benzyl acetate was described as being reminiscent of canned plums or apricots. On a rating scale of 0 (= no resemblance to plums) to 5 (= very plum-like) canned Victoria and Golden Egg plums received scores of 2.1 and 1.4, resp., the difference between the 2 being significantly different at the 1% level. DIH

72

A preliminary study on the flavor and aroma components of four mango varieties.

Diaz, N.

Journal of Agriculture of the University of Puerto Rico 64 (3) 357-362 (1980) [17 ref. En, es] [Food Tech. Lab., Mayagüez Campus, Univ. of Puerto Rico, Rio Piedras, Puerto Rico]

Mango var. Edward, Palmer, Keitt and Zill were selected to study the possible relation between the flavour and aroma components or their precursors in the mature green fruit at harvest and in the same fruit ripened under controlled conditions. Flavour quality was also evaluated. The fruits were hand picked from trees at the Fortuna substation and stored at 70°F (21°C) and 80% RH. After 7-10 days in storage, good eating quality mangoes were attained. Sensory evaluation for flavour scored from 5.3 to 5.6 in a (1-poor to 6-good) 6-point hedonic scale. The gas chromatographic

analysis showed differences in the number and concn. of certain components among var. and within the same depending on their stage of ripeness. Green fruits showed a larger number of components than ripe fruit in general. Var. Palmer and Zill seem to be richer in flavour and aroma components than var. Edward and Keitt. The identity of 15 flavour and aroma components of mango essence, including alcohols, aldehydes, ketones and terpenes, was established by gas chromatography-MS and comparison with reference spectra. AS

73

[Warm holding of potatoes in air, N₂ and CO₂. Effects on sensory quality, ascorbic acid content and volatile constituents.]

Karlström, B.; Anderson, J.; Thorsell, U.; Jonsson, L. *SIK Rapport* No. 447, 46pp. (1978) [5 ref. Sv, en] [SIK - Svenska Livsmedelsinst., Fack, S-400 21 Göteborg, Sweden]

Studies were conducted on holding of boiled potatoes of the var. Bintje, King Edward and Magnum Bonum at approx. 75°C for ≤4 h in air, CO₂ or N₂. Sensory properties of the potatoes were evaluated, ascorbic acid losses were determined, and volatile aroma compounds were determined by GLC. Tables and graphs of results are given. Holding in N₂ or CO₂ gave appreciably better flavour, aroma, appearance and consistency than holding in air; little difference was detectable between samples held in N₂ and those held in CO₂. Holding in CO₂ or N₂ was also found to reduce losses of ascorbic acid, and to prevent or considerably reduce formation of volatiles characteristic of off-flavour development in warm-held potatoes. AJDW

74

Identification of a new volatile compound in onion (*Allium cepa*) and leek (*Allium porrum*): 3,4-dimethyl-2,5-dioxo-2,5-dihydrothiophene.

Albrand, M.; Dubois, P.; Etievant, P.; Gelin, R.; Tokarska, B.

Journal of Agricultural and Food Chemistry 28 (5) 1037-1038 (1980) [12 ref. En] [INSA Lab. de Chimie Organique, F-69621 Villeurbanne Cedex, France]

Onions were chopped, slurried with water and the slurry was extracted with Freon 11. After concentration, volatile components of the organic phase were isolated and characterized by GLC-MS. Twelve main volatiles were identified, as well as an unknown eluted from the glass capillary/Carbowax GLC column after 1-(propyl-trithio)propane. On the basis of its mass, NMR and IR spectra, and comparison with synthesized compound, the unknown was identified as the title compound. The compound was similarly identified in leek; this is the first report of its occurrence in onion or leek. The sensory threshold of detection (in water) was approx. 7 ng/ml. DIH

75

Analysis of the volatile constituents of baked, "Jewel" sweet potatoes.

Purcell, A. E.; Later, D. W.; Lee, M. L.

Journal of Agricultural and Food Chemistry 28 (5) 939-941 (1980) [18 ref. En] [Dep. of Food Sci., N. Carolina State Univ., Raleigh, N. Carolina 27650, USA]

The volatile organic compounds of baked, 'Jewel' sweet potatoes were trapped on porous polymer precolumns and analysed by capillary column GLC-MS. 30 compounds were identified: methanol, ethanol, acetone, diethyl ether, dichloromethane, 2,3-butanedione (diacetyl), 3-methylpentane, hexane, tetrahydrofuran, methylcyclopentane, 2,3-pentanedione, methylbenzene (toluene), 2-methyltetrahydrofuran-3-one, furfuraldehyde, dimethylbenzene (xylene), isobutyronitrile, 2-pyrone, heptanal, 2-furyl methyl ketone, benzaldehyde, 5-methyl-2-furaldehyde, trimethylbenzene (mesitylene), octanal, 2-pentylfuran, phenylacetaldehyde, nonanal, linalool, decanal, β-ionone, and 4-(2,2,3,3-tetramethylbutyl)phenol. AS

76

Volatiles of apples (var. 'Schone van Boskoop'): isolation and identification.

Feys, M.; Tobback, P.; Maes, E.

Journal of Food Technology 15 (5) 485-492 (1980) [12 ref. En] [Lab. for Food Preservation, Catholic Univ. of Leuven, de Croylaan 42, B-3030 Leuven, Belgium]

A simple method for the analysis of apple volatiles was developed. By means of a modified vacuum-cold trap distillation an aqueous solution of volatiles, ready for direct GLC-analysis, is obtained. Formation of artefacts (e.g. volatile aldehydes) during homogenization of the apple tissue was prevented by addition of trichloroacetic acid. About 15 volatiles of the apple var. 'Schone van Boskoop' have been identified and quantified. More than 85% of the total volatile fraction are alcohols. The recovery for the different volatiles ranged from 60 to 95% depending on the nature of the compounds. In a dichloromethane extract of the distillate a few minor compounds, mostly esters, were identified by MS. AS

77

[Review of aromatic substances in milk fat.] (In 'Zbornik prednasok zo IV. celostatneho Sympozia o aromatickych latkach v pozivatinach' [see FSTA (1981) 13 5T214].) [Lecture]

Cupakova, M.

pp. 68-73 (1979) [31 ref. Sk] [Vyskumny Ustav Potravinarsky, Bratislava, Czechoslovakia]

This review deals with major groups of aromatic substances in milk fat (fatty acids, aliphatic aldehydes, ketones, lactones) and precursors in relation to the development of new milk fat based foods of improved flavour. FL

78

[GLC 'head space' analysis of highly volatile compounds in milk products.] (In 'Zbornik prednasok zo IV. celostatneho Sympozia o aromatických látkach v potravínach' [see FSTA (1981) 13 5T214].) [Lecture] Palo, V.; Katra, J. pp. 24-32 (1979) [8 ref. Sk] [Chemickotech. Fak., Slovenska Vysoka Skola Tech., 880 37 Bratislava, Czechoslovakia]

A method developed from that of Palo & Hrivnak [XVII International Dairy Congress D, 387] is described. 6 g anhydrous Na_2SO_4 are heated in a 25-ml flask for 12 h at 120°C. 5 ml milk product (milk, yoghurt, kefir, cream starter) or 5 g 40% aqueous cheese homogenate are added, the flask is immediately closed with a ground-in glass stopper held in position by a piece of rubber tubing and is heated in a waterbath for 10 min at 60°C. 1 ml head-space contents are then removed by syringe through the tube wall and analysed by GLC; contents of acetone, ethanol, methyl ethyl ketone and diacetyl are determined. The procedures are described in detail. Variation coeff. for 10 determinations of each of the compounds in cream starter were 2.5, 4.0, 5.7 and 12.6% resp. SKK

79

Changes in the quality of Baltic herring roe products during cold- and frozen-storage.

Linko, R. R.; Vuorela, R.; Kaitaranta, J.

Scandinavian Refrigeration 9 (2) 102-103 (1980) [En, Fi] [Dep. of Chem. & Biochem., Univ. of Turku, SF-20500 Turku 50, Finland]

A brief account is given of studies on changes in the microbiological, chemical and sensory quality of Baltic herring roe products preserved with chemical additives, by salting, pasteurization or freezing and stored for 1 yr at +5°C or -25°C. After 3 months at 5°C, the total bacterial count and total volatile N and trimethylamine concn. in lightly-salted samples (6% NaCl) increased appreciably; little change was observed in the microbiological quality of heavily salted, pasteurized or frozen samples. Lipid hydrolysis in salted and chemically preserved samples was not dependent on NaCl or preservative concn.; rate of lipid hydrolysis in pasteurized or frozen samples was lower than in salted or chemically-preserved samples. Frozen storage in low- O_2 -permeability packs gave the best quality retention; samples packaged in normal polyethylene bags showed relatively poor quality retention. Pasteurization controlled microbiological and enzymic deterioration, but did not prevent lipid oxidation; discoloration and a 'boiled' off-flavour were also observed in the pasteurized product. Heavy salting gave acceptable results in short-term storage. AJDW

80

[The sulphur-containing compounds and quality of cured meat products as influenced by curing and heating.] [Lecture]

Bol'shakov, A. S.; Vorontsov, A. A.; Grigor'yeva, I. Ya.; Zabashta, A. G.

Proceedings of the European Meeting of Meat Research Workers No. 25, 8.7:739-8.7:744 (1979) [6 ref. Ru, en, de, fr] [Moskovskii Tekh. Inst. Myasnoi i Molochnoi Promyshlennosti, Moscow, USSR]

Changes in levels of H_2S , mercaptans, thioesters, SH-groups and free S-containing amino acids were revealed in the production of cured meat products. The quantity of volatile S compounds was related to the flavour of cured meat. The rate of the changes in the concn. of S-containing compounds was found to be dependent on the kind of meat and the degree of autolysis prior to curing, and was particularly high during cooking. [See FSTA (1981) 13 5S668.] STI

81

[Influence of curing and heat treatment on the content of volatile carbonyls and the quality of cured meats.] [Lecture]

Bol'shakov, A. S.; Dragina, V. V.; Grigor'eva, I. Y.; Zabashta, A. G.; Estebešov, M. A.

Proceedings of the European Meeting of Meat Research Workers No. 25, 8.6:733-8.6:738 (1979) [6 ref. Ru, en, de, fr] [Moskovskii Tekh. Inst. Myasnoi i Molochnoi Promyshlennosti, Moscow, USSR]

Changes in monosaccharides, free amino acids, and volatile carbonyl compounds during the production of cured meats were studied. The correlation between the quantity of volatile carbonyl compounds and the flavour of cured meats was determined. It was shown that accumulation of substances influencing the flavour of cured meats is connected with the penetration and the rate of distribution of curing salts in muscle tissue and changes in the structure of the meat. Combination of mechanical influence on meat and injection with multi-component brine contributes to the improvement of quality in cured meats. [See FSTA (1981) 13 5S668.] STI

82

Volatile monocarbonyl compounds in hams manufactured by different technologies, at the final stage of aging. [Lecture]

Gadzheva, D.; Nestorov, N.; Baichev, I.

Proceedings of the European Meeting of Meat Research Workers No. 25, 8.4:721-8.4:725 (1979) [En, de, fr, ru] [Meat Tech. Res. Inst., Sofia, Bulgaria]

Using combined TLC and GLC, an analysis of volatile carbonyl compounds was made in hams prepared by a rapid process or in the classical manner: the contents of most of the monocarbonyl substances in conventionally made ham are higher than those in ham made by the rapid process. The alkanones subfraction changes to a greater extent than alkanals and some more polar unsaturated monocarbonyls. [See FSTA (1981) 13 5S668.] STI

83

[Recent progress in food flavours: the role of heterocyclic compounds.]

Vernin, G.

Industries Alimentaires et Agricoles 97 (5) 433-449 (1980) [21 ref. Fr, de, en] [Fac. de Sci. & Tech. de Saint-Jerome, Marseille, France]

Heterocyclic compounds are very widely distributed in foods, especially among aroma compounds. They have been found in cooked, boiled or roasted foods, e.g. meat, vegetables, fruits, nuts, tea, coffee, cocoa, alcoholic beverages, and dairy products. They have strong and characteristic flavours and are important ingredients for the food industry. They are formed mainly by non-enzymic browning (Maillard) reactions. The various steps of this reaction are briefly described. Chemical formulae, threshold of detection, characteristic flavours and sources of some compounds are shown in tabular form. [From En summ.] RM

84

[Presence of flavour compounds in foods. I. Safrole: identification and determination by headspace GLC.]

Salvatore, G.; Stacchini, A.; Marzio, S. di *Rivista della Societa Italiana di Scienza dell'Alimentazione* 9 (4) 253-264 (1980) [44 ref. It, en] [Istituto Superiore di Sanita, Rome, Italy]

A method for detn. of safrole in foods and beverages is described, based on headspace analysis by GLC on a 2 m x 2 mm glass column packed with 24% FFAP on Anakrom A 100-110 mesh, with flame ionization detection. Detection limit is <0.1 mg/l. Accuracy and reproducibility are good. Analysis of 19 samples of vermouth, bitters etc. showed 7 to contain safrole, at concn. of 0.5-3.2 mg/l. Essential oil of nutmeg contained 2.0% safrole; nutmeg oleoresin contained 1.1%, and mace oleoresin contained 3.4% safrole. No safrole was detected in any of 7 samples of soft drinks. AJDW

85

Animal and vegetable fats and oils - Determination of moisture and volatile matter content.

International Organization for Standardization

International Standard ISO 662-1980, 2pp. (1980) [En]

2 methods are specified for the detn., by drying, of the moisture and volatile matter content of animal or vegetable fats or oils: (i) using a sand bath or hot-plate, applicable to all fats and oils; and (ii) using a drying oven, applicable only to non-drying fats and oils with acid value <4 (lauric acid must not be analysed by this method). Both methods involve heating a test portion at $103 \pm 2^\circ\text{C}$ until moisture and volatile substances are completely eliminated, and detn. of the loss in mass. AL

86

Environmental carcinogens selected methods of analysis. Vol. 1. Analysis of volatile nitrosamines in food.

Preussmann, R.; Castegnaro, M.; Walker, E. A.;

Wassermann, A. E. (International Agency for Research on Cancer) (Editors)

IARC Scientific Publications No. 18, xiii + 212pp.

ISBN 92-832-1118-9 (1978) [many ref. En] [IARC, Lyon, France]

This book gives a detailed evaluation of the literature and details of methods available for the analysis of volatile nitrosamines. The 3 sections of the book are: Carcinogenicity of *N*-nitroso compounds (pp. 3-9); General review of approaches to nitrosamine analysis (pp. 13-77, including 21pp. of references); and Methods of analysis (pp. 81-212). Individual chapters are as follows. Carcinogenicity of *N*-nitroso compounds and their possible role in the development of human cancer, by L. Gričute (pp. 3-9, 36 ref.). Sampling and samples, by T. Kawabata (pp. 13-14). Extraction and clean-up methods, by G. M. Telling (pp. 15-20). Final chromatography and detection, by N. P. Sen (pp. 21-27). Mass spectrometric techniques, by T. A. Gough (pp. 29-34). Derivative formation, by G. Eisenbrand (pp. 35-39). The use of chemiluminescence-based detectors, by D. H. Fine (pp. 41-42). A brief review of analytical methods for the determination of amines, by G. B. Neurath (pp. 43-47). A brief review of analytical methods for the determination of nitrate and nitrite in foodstuffs, by G. M. Telling (pp. 49-56). Analysis of volatile *N*-nitrosamines in food using flame thermionic detection and mass spectrometry confirmation, method 1, by T. Fazio, J. W. Howard & D. Havery (pp. 83-96); method 2, by T. Kawabata, M. Nakamura, M. Matsui & T. Ishibashi (pp. 97-107); and method 3, by W. Fiddler, J. W. Pensabene, J. C. Dooley & A. E. Wasserman (pp. 109-118). Analysis of volatile *N*-nitrosamines using gas chromatography with Coulson detector: estimation of *N*-nitrosopyrrolidine by TLC with fluorimetric detection, by N. P. Sen (pp. 119-131). Determination of volatile *N*-nitrosamines in food by chemiluminescence using the thermal energy analyser, by D. H. Fine (pp. 133-140). Mass spectrometric determination of volatile *N*-nitrosamines after screening by the Coulson electrolytic detector, by T. Gough & K. Webb (pp. 141-150). [Continued in following abstr.] AL

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Environmental carcinogens selected methods of analysis. Vol. 1. Analysis of volatile nitrosamines in food.

Preussmann, R.; Castegnaro, M.; Walker, E. A.; Wassermann, A. E. (International Agency for Research on Cancer) (Editors)

IARC Scientific Publications No. 18, xiii + 212pp. ISBN 92-832-1118-9 (1978) [many ref. En] [IARC, Lyon, France]

[Continued from preceding abstr.] Meat and meat products - mass spectrometric determination of volatile *N*-nitrosamines, by R. W. Stephany, J. Freudenthal & P. L. Schuller (pp. 151-161). Mass spectrometric determination of volatile *N*-nitrosamines in food, by G. M. Telling, D. R. Hoar & T. A. Bryce (pp. 163-173). Analysis of volatile *N*-nitrosamines in food by electron capture and Coulson detection of their *N*-nitramine derivatives, by E. A. Walker, M. Castegnaro & B. Pignatelli (pp. 175-187). Analysis of volatile *N*-nitrosamines in meat products using oxidation of

N-nitrosamines to *N*-nitramines and electron-capture detection of *N*-nitramines, by S. J. Kubacki & A. Borys (pp. 189-197). Analysis of volatile *N*-nitrosamines in food using *N*-specific detection and ion-specific determination of heptafluorobutyramides by gas chromatography/low-resolution mass spectrometry, by G. Eisenbrand & R. Preussmann (pp. 199-212). AL

88

[A new method for the enrichment of head space components using wine as an example.] Eine neue Methode zur Anreicherung von DampfkompONENTEN. Dargestellt am Beispiel des Weines. Rapp, A.; Knisper, W.

Chromatographia 13 (11) 698-702 (1980) [10 ref. De, en] [Bundesforschungsanstalt für Rebenzüchtung, Geilweilerhof, D-6741, Siebeldingen, Federal Republic of Germany]

A new and simple method is described for concn. of the head space components of wine, excluding water and ethanol. The procedure has important advantages compared with other methods where aroma components are concentrated on porous polymers (Tenax, Chromosorb 105, etc.). The extract obtained can be analysed several times using different detection systems like FID (flame ionization) GLC-MS, or sensory evaluation, depending on the information required. The volatile components introduced into the extraction apparatus from the inert gas stream are removed quantitatively (> 99%). The extracts contain no impurities. Formation of artefacts is virtually impossible because of the mild conditions. No special injection systems are needed. Using this method, new terpenoid compounds were identified in the bouquet of the grape cv. Morio-Muskat. The apparatus is shown and results tabulated. AS

89

[The volatile fraction of orange juice. IV. Identified components.]

Alberola, J.; Izquierdo, L.

Revista de Agroquímica y Tecnología de Alimentos 20 (1) 79-86 (1980) [45 ref. Es, en] [IATA, Valencia, Spain]

Compounds identified by various authors in the volatile fraction of orange juice are compiled in a table. Components responsible for off-flavours of orange juice due to inadequate processing or extended storage are also listed. Some of these compounds are suggested as quality indicators. [See FSTA (1980) 12 10H1530 for part III.] AS

90

The neutral volatile components of cider apple juices.

Williams, A. A.; Lewis, M. J.; Tucknott, O. G.

Food Chemistry 6 (2) 139-151 (1980) [17 ref. En] [Food & Beverages Div., Long Ashton Res. Sta., Long Ashton, Bristol, UK]

Examination of the volatile compounds from juices of 4 cv. of Cider apple (Bramley's Seedling, Sweet Coppin, Kingston Black and Yarlington Mill) led to the definite identification of 18 alcohols, 48 esters, 5 carbonyls,

8 acetals, 4 ethers, 1 lactone, 1 hydrocarbon and 3 halogenated compounds and tentative evidence for a further 51 compounds. 55 of the reported compounds have not been found previously in whole apples or juices. Of these *cis*- and *trans*-linalool oxide and the presence of 5-hexen-1-ol rather than 2-hexen-1-ol in the juice of Kingston Black cv. are of particular interest. Differences between cv. were largely quantitative and due to variations in the amounts of components with b.p. in excess of that of hexanol. AS

91

[Changes in roasted Arabica coffee stored in four model packagings. Changes in the volatile fraction. Comparison with a control. Optimum utilization time limit.]

Cros, E.; Fourny, G.; Guyot, B.; Rouly, M.; Vincent, J.-C. *Cafe-Cacao-The* 24 (3) 203-226 (1980) [13 ref. Fr, en, es, de] [IFCC, Avenue du Val de Monferrand, BP 5035, 34032 Montpellier Cedex, France]

Sensory analysis, head space analysis (44 compounds), and changes in beverage acidity were used to study the storage of green Colombian Arabica coffee beans for 40 wk in 4 model packagings - loose (7 kg, in bulk), simulated normal packaging (mylothene metallic, 230 g/packet), vacuum packaging, bags with a valve, and a control (deep-frozen 7 h after roasting). Results are shown graphically and in tables. Sensory analysis showed that the definition of optimum storage time depends on the control (in the present case 6-26 wk), storage in airtight packaging promotes retention of the aromatic character of the beverage; increase in acidity and reduction in the aromatic character of the beverage depends on the air tightness of the packaging. Chemical analysis showed that composition of the volatile fraction depends on storage time, and all samples follow a decreasing curve of the type $y = ae^{-bx} + C$; the optimum utilization limit date has no significance since all samples change after roasting; the 4 samples were substantially identical during 2 months of storage; the acidity and the buffering power of the beverage give information on the packaging. AS

92

[Study of the aromatic fraction of orange juice. II. Comparison of vacuum distillation techniques for isolation of volatiles.]

Sauri, E.; Nadal, I.; Alberola, J.; Sendra, J. M.; Izquierdo, L.

Revista de Agroquímica y Tecnología de Alimentos 20 (2) 220-230 (1980) [15 ref. Es, en] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

3 techniques based on vacuum distillation for isolating the volatile fraction of orange juice were compared: (i) distillation through a packed column, (ii) simultaneous distillation-extraction, and (iii) distillation in a rotary evaporator. Tabulated data showed that best results were obtained by methods (i) and (ii) when the juice was stripped with N_2 during distillation, and condensed vapours were retained by bubbling in dichloromethane cooled with ethylene-dry ice ($-78.5^\circ C$). High reproducibility and extraction yields about 100% were obtained with both techniques [See FSTA (1976) 8 10H1765 for part I.] AS

3

Determination of hydrophilic volatiles in gas- aqueous liquid systems by Grob's closed-loop strip/trap method and standard-addition calibration.

lovak, J.; Golias, J.; Drozd, J.
Journal of Chromatography 204, 421-428 (1981) [5 ref.
n] [Inst. of Analytical Chem., Czechoslovak Academy
of Sci., 61142 Brno, Czechoslovakia]

The application of Grob's closed-circuit strip/trap
technique to the detn. of hydrophilic volatiles in
aqueous matrices by the standard-addition method was
investigated. Tenax GC was used as the trapping
material. Both the conservation and equilibrium
alternatives of trapping were assessed, employing butyl
acetate and ethanol as model compounds, resp. With
both alternatives the experimentally found dependences
of the amount of concentrate recovered from the trap
on the total amount of the respective component in the
system analysed were fairly linear. The technique gives
an extremely high selectivity of analysis. An application
of the procedure to the headspace gas analysis of apple
juice is demonstrated. AS

94

[Study of aroma of wines from Tierra de Barros (Spain) by phase separation through salt addition and GLC of the organic phase.]

Mesias, J. L.; Maynar, J. I.; Mareca, I.
Revista de Agroquímica y Tecnología de Alimentos
20 (2) 240-246 (1980) [6 ref. Es, en] [Fac. de Ciencias,
Badajoz, Spain]

With the aim of finding a fast method for quantitative
extraction and analysis of volatiles in wine, phase
separation by addition of salts was studied in aqueous
alcohol solutions and in white wines. The distribution of
the volatiles between phases and conditions for max.
concn. of the volatiles in the organic phase were studied.
The conditions selected were: a mixture of $(\text{NH}_4)_2\text{SO}_4$
and NaH_2PO_4 , pH 3.5, 25°C. The method was applied to
white wines from Tierra de Barros, and results
compared to Montanez and Jerez wines, using GLC
with octanol-1 as internal standard. Results, shown
graphically and in tables, confirmed that using a
correction factor of 1.10 with respect to octanol-1 the
method gave reproducible results for a wide range of
components, from very volatile (ethyl acetate) to
heavier ones (2 phenyl-ethanol). A portion of the
coloured components that may cause problems in
chromatography is extracted during the procedure.
Results are not significantly affected by prior
decolorant treatments. RM

95

[Total volatile basic nitrogen (TVB-N) of fresh sea fish marketed in the interior of Germany.] Der flüchtige Basenstickstoff (TVB-N) bei im Binnenland in den Verkehr gebrachten frischen Seefischen.

Lang, K.
Archiv für Lebensmittelhygiene 30 (6) 215-217 (1979)
[6 ref. De, en] [Inst. für Tierärztliche
Nahrungsmittelkunde, Justus-Liebig-Univ., Frankfurter
Strasse 92, 6300 Giessen, Federal Republic of Germany]

80 samples of fresh sea fish acquired over 1 yr from
food shops in Giessen (cod fillets, red fish (ocean perch)
fillets, saithe fillets, green herrings and plaice) were
analysed for TVB-N according to Antonacopoulos [see
FSTA (1971) 3 8R338]. Tabulated results showed
24 samples (30%) with > 35 mg and 18 (22.5%) with
> 40 mg TVB-N/100 g. and unfit for human
consumption. RM

96

Flavour extracts.

Procter & Gamble Co.

UK Patent Application 2 040 666A (1980) [En]

Flavour extracts are obtained from coffee, tea, cocoa
beans, and fruits by continuous desorption of an
aqueous extract through a columnar bed of substrate
using countercurrent flow. IFT

97

[Natural flavour extracts.]

Nissan Motor KK

Japanese Examined Patent 5 535 091 (1980) [Ja]

In a 2 phase solvent extraction process for natural
flavour extracts essential oils active as odour
constituents are extracted with a dry gas under
supercritical conditions, after which the fractions active
as taste auxiliaries are extracted with the same humid
gas. IFT

98

[Food flavours.]

UNICHIM

Essenze Derivati Agrumari 49 (4) 269-277 (1979) [It]

Tables are reprinted, prepared by UNICHIM with
the aid of the Blue book (Council of Europe), an IARC
(International Agency for Research on Cancer, Lyon)
monograph and IOFI (International Organization of the
Flavour Industry) documents. Table 1 contains: a list of
natural flavour components recommended for limiting
in finished food products, their main natural plant
sources, and their concn. in the plants and essential oils;
Table 2 gives the max. tolerances in finished food
products and beverages and exceptions. (EEC, Council
of Europe and IOFI). RM

99

Analysis of nutmeg oil using chromatographic methods.

Schenk, H. P.; Lamparsky, D.

Journal of Chromatography 204, 391-395 (1981)

[12 ref. En] [Givaudan Res. Co. Ltd., CH-
8600 Dubendorf, Switzerland]

Various chromatographic methods were used for
analysis of nutmeg oil. In addition to the 14 known
monoterpene hydrocarbons, α , p -dimethylstyrene was
identified together with 16 monoterpene alcohols,
7 esters and 8 sesquiterpene hydrocarbons. The
occurrence of the missing *trans*-isomer of *p*-menth-2-
en-1-ol and a bifunctional derivative of the same type
(*trans-p*-menth-2-ene-1,4-diol) are of special interest.
Besides the terpenoid constituents, 2 unsaturated
aliphatic compounds, namely, (*E*)-3-methyl-4-decen-1-ol
and its acetate, were detected for the first time in a
natural substrate. AS

100

Potential artefacts from using porous polymers for collecting aroma components.

Lewis, M. J.; Williams, A. A.

Journal of the Science of Food and Agriculture 31 (10) 1017-1026 (1980) [20 ref. En] [Food & Beverages Div., Long Ashton Res. Sta., Bristol BS18 9AF, UK]

Examination of the components produced by heating Porapak Q and Tenax GC above their normal operating temp. revealed the presence of hydrocarbons, benzaldehyde, ethylbenzaldehyde, acetophenone,

ethylacetophenone, isopropyl-benzyl alcohols, diacetylbenzene, phenol and furans, all of which could potentially occur as artefacts when using these porous polymers for collecting and concentrating aroma components from foods. AS

101

A preconcentration and subsequent gas liquid chromatographic analysis method for trace volatiles. Singleton, J. A.; Pattee, H. E.

Journal of the American Oil Chemists' Society 57 (12) 405-408 (1980) [11 ref. En] [Dep. of Botany, N. Carolina State Univ., Raleigh, N. Carolina 27650, USA]

Preconcentration of headspace volatiles is an important technique for analysis of vapours. A glass column containing a porous polymer (Porapak Q, 80-100 mesh) was used to trap volatiles from enzymic degradation of peanut and soybean homogenates. Concentrated volatiles were fed into the injection port of a GLC column for analysis. Volatiles could be stored on the polymer matrix; multiple columns of the same, or different trapping materials could be used. LH

102

A versatile all-glass GC/MS interface for capillary columns.

Schmid, P. P.; Müller, M. D.; Simon, W.

Journal of High Resolution Chromatography and Chromatography Communications 2 (5) 225-228 (1979) [15 ref. En] [Swiss Fed. Inst. of Tech., Universitätsstrasse 16, CH-8092 Zürich, Switzerland]

A new all-glass interface for GC/MS designed to exploit the potential of glass capillary columns fully is described. The system works in the open split mode and has high versatility with respect to column changing. It is especially suitable for mass spectrometers which are not exclusively dedicated to GC/MS work. 2 chromatograms illustrate the properties of the described interface. AS

103

[Study of volatile substances produced during melanoidin synthesis in the model system glyceraldehyde + glycine.]

Korzhova, L. P.; Romakov, Yu. A.

Prikladnaya Biokhimiya i Mikrobiologiya 14 (3) 414-419 (1978) [20 ref. Ru, en] [Nauchno-issled. Lab. MZ SSSR, Moscow, USSR]

The reactions in the model system at 37°C and 80°C, resp. resulted in formation of melanoidine (409 ± 60 and 1582 ± 56 units of optical density, absorbance at

400 nm) and yielded CO_2 (10 ± 0.5 and 152 ± 1.3 μmol , resp.) and trace amounts of ammonia and carbonyl compounds. When the incubation temp. was 80°C the browning rate and quantities of volatile substances increased, although there was no correlation between these 2 parameters. Experiments with [^{14}C] and [^{14}C]glycine showed that at 37° and 80°C, resp., <1 and approx. 6% of the amino acid degraded to form CO_2 . The carboxyl group was the only source of CO_2 . No radioactivity occurred in volatile carbonyl compounds; data are tabulated for distribution of radioactivity in samples using the 2 different glycine isotopes. It was concluded that decarboxylation and deamination of the amino acid during its interaction with glyceraldehyde are not important in melanoidin synthesis. RAW

104

Detection of lipid degradation products in the water of a reservoir during a bloom of *Synura uvella*.

Jüttner, F.

Applied and Environmental Microbiology 41 (1) 100-106 (1981) [28 ref. En] [Inst. für Chem. Pflanzenphysiol., Univ., D 7400 Tübingen, Federal Republic of Germany]

A stripping method was used to determine the volatile compounds present in the raw water of a reservoir during a heavy bloom of *Synura uvella*. Besides numerous pollution products, a large number of previously unidentified algal excretion products were determined, including alkenes, alcohols, ketones, aldehydes, and nor-carotenoids. The approx. amounts of some important algal excretion products present in the raw water are stated. Their biosynthetic origin and possible function in the ecosystem are discussed. The offensive cod liver oillike odour which *Synura* imparts to the raw water was traceable to *trans,cis*-deca-2,4-dienal and minor amounts of *trans,cis*-hepta-2,4-dienal. AS

105

Apparatus for the dearomatization of coffee oil.

Hurlow, G. S.; Blain, J. R.; Coombes, M.; Richard, J.-C.; Hitchinson, P. W. (General Foods Ltd.)

United States Patent 4 232 598 (1980) [En]

This invention relates to an improved process for the separation and isolation of coffee aroma constituents from roasted coffee, combining the aroma constituents with an edible substance, e.g. coffee oil, and subsequently incorporating the aromatized substance in a food product, e.g. instant coffee. The process involves improving the condensation of vapours generated from the distillation of coffee oil by condensing the distilled aroma constituents onto a sleeve cooled by and snugly surrounding a container filled with coolant. The sleeve is removed and the aroma constituents condensed thereon are then preferably combined with an edible substance by manipulating the condensed constituents quickly and efficiently, thus minimizing aroma loss and degradation caused by undesirable prolonged contact with air. RAW

106

[GLC evaluation of aroma, with special reference to alcoholic beverages.]

Calabro, G.

Rassegna Chimica 32 (3) 125-134 (1980) [7 ref. It]
[Istituto di Merceologia, Univ. di Messina, Messina, Italy]

The problem of objective evaluation of food and beverage flavours is discussed, with a critical examination of sample preparation methods. The contribution of high-performance glass capillary GLC is illustrated with the aid of chromatograms of lemon essence, cold-extracted and aged. RM

107

[Study of aroma forming substances in dessert and fortified wines.]

Rodopulo, A. K.; Egorov, I. A.; Kormakova, T. A.
Prikladnaya Biokhimiya i Mikrobiologiya 14 (3) 441-445 (1978) [3 ref. Ru, en] [Inst. Biokhimii im. A. N. Bakha AN SSSR, Moscow, USSR]

GLC was used to determine aroma forming substances in dessert wines (i) Muscat and (ii) Cahors, and in fortified wines (iii) Port-wine and (iv) Madeira. Content of aliphatic (C_2-C_9) and aromatic alcohols was greater in (iii) and (iv) than in (i) and (ii) (details tabulated): total alcohols were (mg/l) 78.7, 42.7, 173.6 and 286.1 in (i), (ii), (iii) and (iv), resp. (i) had comparatively high content of terpenoid compounds and their esters (2.25 mg/l linalool and 1.5 mg/l linalyl acetate); the latter compounds were possible flavour enhancers for (i). (iv) contained high levels of terpeneol (1.8 mg/l) and of *cis*- + *trans*-farnesol (1.0 mg/l), which enhanced aroma of (iv). Detailed results of carbonyl compounds and esters for (i)-(iv) are tabulated. (iv) had high content of aldehydes (mg/l), especially acetaldehyde (81.8) and diacetyl (10.5), which enhanced aroma of (iv). Total esters (mg/l) were 66.8, 47.8, 90.8 and 158.4 in (i), (ii), (iii) and (iv), resp. RAW

108

[Changes in aroma substances of strawberries, sweet cherries and morello cherries under various heat-treatment regimes.]

Grigorova, S.; Videv, K.; Tanchev, S.; Katsarova, S.;

Furlinski, I.

Khranitelna Promishlenost 29 (4) 22-25 (1980) [4 ref. Bg, ru, de, en]

(i) strawberries (Senga Sengana), (ii) sweet cherries (Bigoro Moro) and (iii) morello cherries (Senchesta) were made into compotes, with sterilization in glass jars either by the customary procedure at 100°C, or by a HTST procedure at 110°C designed by the authors (heat treatment regimes for (i)-(iii) are tabulated). Samples of fresh (i)-(iii) in glass jars, covered with either cooled boiled syrup or with syrup at 85°C served as controls. Aroma substances obtained from homogenized jar contents of (i)-(iii) by vacuum distillation were analysed on a Carlo Erba Fractovap 2407T GLC apparatus. Data for 14 peaks of (i), 10 of (ii) and 9 to (iii) are tabulated for all variants. It is concluded that, in comparison with controls, the intensified procedure at 110°C caused much less alteration of the aroma pattern of (i)-(iii) than the customary procedure. SKK

109

[Effect of sunflower oil addition on content of monocarbonyl organic compounds in the volatile components of wheat bread.]

Enikeeva, N. G.; Uralets, V. P.; Golovnya, R. V.; Dremucheva, G. F.

Prikladnaya Biokhimiya i Mikrobiologiya 14 (3) 420-428 (1978) [13 ref. Ru, en] [Moskovskii Tekh. Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

A study was carried out on aliphatic monocarbonyl compounds in volatile components of crust and crumb of wheat bread baked from type 1 flour (control) or from type 1 flour + 5% sunflower oil (test sample), using gas chromatography and sensory evaluation. Test bread had a higher total sensory score (84.1) than control bread (76.25) and had increased content of 2,4-dinitrophenylhydrazones of monocarbonyl compounds both in the crust and crumb. Test bread had decreased acetaldehyde (54.4 and 36.9% in crust and crumb, resp., vs. 2.0 and 6.1%, control); it also had increased content of acrolein, butanol and hexanal in volatile components which affected bread sensory evaluation (chromatograms for test bread and tabulated data for test and control breads are presented for monocarbonyl compounds in crumb and crust). It was possible to conclude that these carbonyl compounds are characteristic of bread enriched with sunflower oil. RAW

110

Detection of hydroxy fatty acids in biological samples using capillary gas chromatography in combination with positive and negative chemical ionization mass spectrometry.

Stan, H.-J.; Scheutwinkel-Reich, M.

Lipids 15 (12) 1044-1050 (1980) [17 ref. En] [Inst. für Lebensmittelchemie, Tech. Univ., Müller-Breslau-

Strasse 10, 1000 Berlin 12]

Saturated and unsaturated hydroxy fatty acids of different chain lengths were produced by various means, viz. lipxygenase activity, fruit homogenization, chemical oxidation, plant cuticle extraction, bacterial fat extraction and deep frying of fats. A method is described for conversion of the hydroxy form to trimethylsilyl (TMS) or heptafluorobutyrate (HFB) derivatives; and the application of gas chromatography with electron impact (EI) - or chemical ionization (CI) - MS. Results from saturated octadecanoic acids with various numbers of hydroxy groups are given. CI-MS was the superior analytical technique; TMS derivatives with positive CI-MS was the best combination for structural analysis, and HFB derivatives with negative CI-MS best for trace analysis of hydroxy fatty acids (detection limit 10×10^{-15} g). The polar fraction of a processed deep frying fat was examined. Its TMS derivatives gave major MS peaks for methyl palmitate, methyl oleate, and methyl stearate, and minor peaks for methyl 9-hydroxy- and 10-hydroxy-octadecanoate and 9,10-dihydroxyoctadecanoate. LH

111

Development and characterization of an improved silicic acid-KOH arrestant column for quantitative isolation of free fatty acids.

Woo, A. H.; Lindsay, R. C.

Journal of the American Oil Chemists' Society 57 (12) 414-416 (1980) [22 ref. En] [Dep. of Food Sci., Univ. of Wisconsin-Madison, Wisconsin 53706, USA]

An improved silicic acid-KOH arrestant column method for the quantitative isolation of free fatty acids (FFA) is described. The method involves preparation of samples in acidified silicic acid caps that are placed directly above alkaline arrestant column portions in glass chromatographic tubes. Neutral lipids are eluted with solvents whereas FFA are stopped as K-salts. FFA are recovered by elution with formic acid-containing solvents. The accuracy and reproducibility of existing methods were greatly improved by minimizing and stabilizing the extent of alkali-induced glyceride hydrolysis. The improved method is suitable for adaptation to a wide variety of food products and biological systems. AS

112

[Aromatic compounds of hydrolysed whey.]

Vasilisina, V. V.; Chebotareva, N. G.;

Golovchenko, V. F.; Panov, V. I.; Tikhomirova, A. S.

Molochnaya Promyshlennost' No. 5, 11-13, 47 (1980) [7 ref. Ru] [Severo-Kavkazskii Filial Vses. Nauchno-issled. Inst. Maslodel'noi & Syrodel'noi Promyshlennosti, USSR]

In view of the wide of application of whey in the baking and other industries, the aromatic compounds of hydrolysed whey were studied. Cheese whey was hydrolysed using *Saccharomyces fragilis* enzymes, and tvorog whey was hydrolysed using *Curvularia inaequalis* enzymes. Contents of volatile fatty acids in normal and hydrolysed cheese whey and normal and hydrolysed tvorog whey determined by GLC were resp. (mg%): formic acid, 0.16, 0.38, 1.75 and 1.46; acetic acid, 4.5, 11.5, 31.1 and 37.9; propionic acid, 0.38, 0.85, 0.72 and 0.83; and butyric acid, 1.06, 1.12, 0.14 and 0.68. Contents of bisulphite-binding compounds in the 2 types of whey, normal, pasteurized or hydrolysed for 0.5-3 h are tabulated; contents increased in products hydrolysed for ≥ 1 h in comparison with normal or pasteurized products, but decreased thereafter. It is concluded that hydrolysed whey is valuable in breadmaking for improvement of taste and aroma. SKK

113

Geosmin and 2-methylisoborneol implicated as a cause of muddy odor and flavor in commercial fish from Cedar Lake, Manitoba.

Yurkowski, M.; Tabachek, J.-A. L.

Canadian Journal of Fisheries and Aquatic Sciences 37 (9) 1449-1450 (1980) [8 ref. En, fr] [Dep. of Fisheries & Oceans, Western Region, Freshwater Inst., Winnipeg, Manitoba R3T 2N6, Canada]

A muddy flavour and odour in commercial fish from Cedar Lake resulted in the closure of the commercial fishing season. GLC indicated the presence of geosmin and 2-methylisoborneol which are known to cause a

muddy flavour in fish. The source of these compounds was not established but they are known to be produced by blue-green algae and actinomycetes. AS

114

[Flavouring and vitamin enrichment of fish products using CO₂ extracts of spices.]

Chaneva, M.; Taran, A.; Kas'yanov, G.; Gorelova, N.; Pekhov, A.

Khranitelna Promishlennost 29 (4) 32-34 (1980) [4 ref. Bg, ru, de, en] [Krasnodarskii Politekh. Inst., Krasnodar, USSR]

Methods of liquid CO₂ extraction of aroma and vitamin compounds from various spices, and their use in fish products developed in the authors' Institute are discussed on the basis of previously published data. SKK

115

Chemical composition of pepper grades and products.

Sumathikutty, M. A.; Rajaraman, K.; Sankarikutty, B.; Mathew, A. G.

Journal of Food Science and Technology, India 16 (6) 249-252 (1979) [17 ref. En] [Reg. Res. Lab., Trivandrum, Kerala, India]

The changes in chemical composition (moisture, berry wt, volatile oil, piperine, crude fibre and starch contents) from the pin head to ripening stage at specific intervals was determined in single var. and in various commercial grades (garbled and nongarbled) of pepper. The average wt. of berries increased and the moisture content decreased up to the mature stage. Conc'n. of volatile oil and piperine increased up to the maturity stage and decreased at the ripening stage. Starch content increased during the maturation period. Bulk density and density increased with increase in grade size. With increasing grade size volatile oil and piperine showed no definite change but a small increase in starch and decrease in fibre content was observed. 'Half' pepper which has a low maturity stage contained high piperine and volatile oil; hence it is best suited for oleoresin extraction. Among the different pepper products examined the piperine and volatile oil contents were lowest in white pepper, (4.1 and 1.6%) followed by buff coloured (5.1 and 1.8%), bottled (7.1 and 3.3%), canned (7.5 and 4.3%) and dehydrated green (8.0 and 3.8%) peppers. As the green pepper is prepared from immature pepper its content of piperine and oil is high. CFTRI

116

Flavour significant compounds in yeast autolysate Gistex X-II powder. II. Neutral and basic fractions.

Hajslova, J.; Velisek, J.; Davidek, J.; Kubelka, V.

Nahrung 24 (9) 875-881 (1980) [20 ref. En, de, ru] [Dep. of Food Chem. & Analysis, Inst. of Chem. Tech., Prague, Czechoslovakia]

The sensory evaluation of the aroma concentrate isolated from yeast autolysate Gistex X-II-powder,

acidic, basic and neutral fractions were isolated, and the aroma components in the basic and neutral fractions were identified by GLC-MS. Basic, acidic and neutral fractions contributed 9.8, 33.4 and 54.6%, resp., to total

aroma. The main components in the basic fraction were alkylpyrazines; carbonyl compounds predominated in the neutral fraction. The total aroma of the neutral fraction (%) comprised carbonyl compounds (51.3), phenolic substances (28.2) and noncarbonyl substances (21.9). Heat treatment of the yeast autolysate at 100°C decreased odour threshold values, and new volatile substances were formed. [See FSTA (1980) 12 4T224 for Part. I.] IN

117

[Biogenic amines in cheese and fish.] Beitrag zur Untersuchung biogener Amine in Käse und Fischen. Pechanek, U.; Blaicher, G.; Pfannhauser, W.; Woidich, H.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 171 (6) 420-424 (1980) [18 ref. De, en] [Forschungsinstit. der Ernährungswirtschaft, Blasstrasse 29, A-1190 Vienna, Austria]

A method for detn. of biogenic amines in food samples such as cheese and fish was developed. Homogenized samples are extracted with 5% trichloroacetic acid. Amines in filtered extract are separated in an amino acid analyser on a Durrum DC 6 ion exchange column; details of the buffer systems and elution programme are given. Free amino acids interfered with the elution peaks of spermidine, ethanolamine, ethylamine and methylamine, but attempts to remove free amino acid using ethyl acetate or butanol led to low recoveries of amines. Recoveries of amines from fish were 80-97%, with limit of detection of 0.05-0.1 mg/kg. The method was used to determine biogenic amines in commercial cheese and fish samples. Ranges of contents found in cheeses (6 different types) were (mg/kg): putrescine <0.05-40.7, histamine 0.1-110, cadaverine <0.05-48.2, tyramine 0.1-418, and phenethylamine <0.1-110. 15 samples of fresh, deep frozen and canned fish (11 types of fish) were analysed; numbers of samples in which amines were detected, and max. levels (mg/kg) found were: putrescine (12 samples) 122, histamine (5) 34.5, cadaverine (7) 34.3, 4-azaheptamethylenediamine (5) 5.3, spermine (14) 26.2, tyramine (2) 5.8, and phenethylamine (2) 38.9. Contents of biogenic amines in hake during decay at 4° and 30°C are tabulated; putrescine, histamine and cadaverine increase during decay, spermine decreases. DIH

118

Retention of volatile components during freeze drying of substances containing emulsified oils. Etzel, M. R.; King, C. J.

Journal of Food Technology 15 (6) 577-588 (1980) [15 ref. En] [Dep. of Chem. Eng., Univ. of California, Berkeley, California 94720, USA]

Measurements were made of the retention of a series of volatile acetates during freeze drying of sucrose solutions containing emulsified vegetable oils. The acetates partition to different extents between the oil and aqueous phases. The observed retentions can be interpreted in terms of a simple model whereby acetates located in oil droplets initially present in

regions ultimately occupied by ice crystals are lost completely, whereas acetates in oil droplets present within residual concentrate are fully retained, and acetate in the aqueous phase is lost according to observations for initially homogeneous systems. As a general rule, only a small fraction of the oil droplets are present within the residual concentrate, and extraction of volatiles into an emulsified oil phase reduces volatiles retention during freeze drying. The results and the model afford a rational interpretation of results [see FSTA (1975) 7 5E165] for retention of individual aldehydes and mixtures of aldehydes during freeze drying of a model food system. AS

119

The development of a soya-based yoghurt. II. Sensory evaluation and analysis of volatiles.

Pinthong, R.; Macrae, R.; Rothwell, J.

Journal of Food Technology 15 (6) 653-659 (1980) [8 ref. En] [Dep. of Food Sci., Univ. of Reading, London Road, Reading RG1 5AQ, UK]

Soy milk was fermented with *Lactobacillus bulgaricus* (BULG) and *Streptococcus thermophilus* (THERM) alone or singly, with appropriate supplementation with yeast extract and glucose, and the products were evaluated organoleptically. Volatiles were collected from products by distillation with N₂ at 40 mm Hg at 37°C, and analysed gas chromatographically. The organoleptic results showed that fermented soy milk was rated significantly higher than soy milk (acidified to pH 4.1), and that fermented cows' milk was rated higher than all fermented soy milks. The different fermented soy milk samples were ranked for preference in the order BULG alone, the combination, THERM alone. Further studies with the apparently preferred BULG and BULG + THERM samples showed that BULG was preferred to BULG + THERM, but that addition of strawberry flavour did not improve acceptability. Addition of 5% sugar + banana flavour is stated to produce an acceptable BULG product. Amounts of volatiles in soy milk and the 3 (unflavoured) fermented soy milks, BULG, BULG + THERM, and THERM are tabulated, including (relative amounts): n-hexanal 10.48, 4.47, 6.63 and 6.25, resp.; and n-pentanal 1.45, 2.42, 26.99 and 34.10. High levels of these compounds in soy milks fermented by THERM may explain their less acceptable taste; decrease in n-hexanal in fermented milks vs. soy milk may explain improvement in taste on fermentation. Contents of acetaldehyde, acetone, methanol and ethanol also differed between products. [See preceding abstr. for part I.] DIH

120

Hydrogen sulfide in brewing.

Nagami, K.; Takahashi, T.; Nakatani, K.; Kumada, J. *Technical Quarterly, Master Brewers' Association of the Americas* 17 (2) 64-68 (1980) [6 ref. En, es] [Cent. Res. Inst., Suntory Co. Ltd., Osaka, Japan]

As H₂S gives one of the typical immature flavours to beer, it is of considerable importance to understand its behaviour when investigating methods of reducing overall brewing times. For this purpose, a new procedure was developed to analyse H₂S contents in a

range of brewing liquors. The analysable range is 0.1–300 parts/billion, the s. e. < 10%, and the analysis time 20–30 min. A modified commercial gas chromatograph was used, combined with the development of a head-space gas sampling system; the procedure is suitable for analysis of all samples from wort to beer. The H₂S contents of fermenting wort varied rapidly, resulting in several peaks of H₂S production related to yeast growth patterns but also influenced by yeast strains, aeration frequency and its degree in the starting wort, contents of hot and cold breaks, and some of the fermentation conditions. The H₂S pattern was essentially the same in any size of fermentation vessel. The O₂ absorption in young beer at the racking process influenced the H₂S behaviour in the lagering process of young beer, and pasteurization affected its behaviour in bottled beer. JRR

121

Volatile components of wild grapes, *Vitis riparia*, M. Schreier, P.; Paroschy, J. H.

Canadian Institute of Food Science and Technology Journal 13 (3) 118–121 (1980) [22 ref. En, fr] [Inst. für Lebensmitteltech., Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

The wild grape *Vitis riparia* M is native to N. America; it grows the furthest north in Canada and USA of all grape spp., is winter-hardy, the earliest ripening and resistant to insects and diseases. It has been widely used in rootstocks and many cultivated hybrids. It has a characteristic aroma and the volatile components were separated by liquid-liquid extraction, and combined vacuum distillation-extraction resp. The volatiles were investigated by adsorption chromatography on silica gel, gas chromatography as well as coupled gas chromatography-MS. In all, 94 compounds were identified in the berries including 20 acids, 33 esters, 18 alcohols, 13 carbonyls, 8 hydrocarbons and 2 substances of miscellaneous structure. Quantitative GLC of the above components was also carried out. A unique and valuable feature of *V. riparia* was the absence of methylanthranilate. ELC

122

[Studies on off-flavour formed during storage of satsuma mandarin juice. I.]

Shimoda, M.; Yamasaki, K.; Osajima, Y.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 54 (4) 271–273 (1980) [9 ref. Ja, en] [Lab. of Food Analysis, Dep. of Food Sci. & Tech., Fac. of Agric., Kyushu Univ., Fukuoka 812, Japan]

Gas chromatographic headspace analysis was applied to satsuma mandarin juice, before and after storage, by means of a pre-column technique, using Tenax-GC in a 3.5 × 90 mm column. The aromagrams obtained consisted of 46 compounds, of which 5 were found to increase greatly during storage, 4 of these were presumed to contribute to off-flavour. Significant decreases in 5 compounds were observed, while α -limonene was fairly stable in the juice. [From En summ.] JRR

123

Microsomal degranulation by tea tannins.

Gupta, M. M.; Dani, H. M.

Current Science 49 (20) 790–791 (1980) [10 ref. En] [Dep. of Biochem., Punjab Univ., Chandigarh-160 014, India]

In vitro and in vivo studies with rats demonstrated that tea tannins are potential carcinogens. Isolated rat liver microsomes incubated with tea tannins (40 µg/ml) in the presence of 1mM NADPH and liver microsomes from rats injected subcutaneously with tea tannins (160 mg/kg body wt.) were studied for degranulation. Results showed that tea tannins degranulated rat liver microsomes by > 0.20% and degranulation was enhanced to about 40% in the presence of NADPH. Presence of Ca²⁺ in the postmicrosomal supernatant or if added from outside protected the microsomes against degranulatory attack of carcinogens. CFTRI

124

[Aroma-forming compounds in young wines from the Northern Caucasus, intended for sparkling wine manufacture.]

Abramov, Sh. A.; Vlasova, O. K.; Makuev, A. M.; Mammaev, A. T.; Rodopulo, A. K.; Egorov, I. A.; Bezzubov, A. A.

Vinodelie i Vinogradarstvo SSSR No. 6, 18–21 (1980) [Ru] [Dagestanskii Filial AN SSSR, USSR]

Composition of aroma-forming compounds in young Rkatsiteli wine from various parts of Northern Caucasus was studied by gas chromatography of pentane-ether extracts and IR spectroscopy. The β -phenylethanol concn. fluctuated between 18.45 and 58.1 mg/l, and esters between 17.29 and 39.23 mg/l. Good sensory evaluations were obtained with 0.33–1.59 mg/l terpenoids and 165.88–403.2 mg/l higher alcohols. The raw material studied differed only slightly in composition from Riesling wines. STI

125

Concentration changes in some volatiles through six stages of a Spanish-style solera.

Kung, M. S.; Russell, G. F.; Stackler, B.; Webb, A. D. *American Journal of Enology and Viticulture* 31 (2) 187–191 (1980) [14 ref. En] [Univ. of California, Davis, California 95616, USA]

Sherry samples taken from each stage of a six-stage fractional blending solera at the University of California, Davis, were analysed for qualitative and quantitative changes in volatile composition. Volatiles were solvent-extracted, concentrated, and analysed by gas chromatography (GC) using wall coated, open tubular, glass capillary columns. Sherry volatiles were identified by combined, computerized GC-MS and by gas chromatographic retention index (RI) data. 20 compounds were identified from among 31 for which quantitative data were obtained. AS

1 26

Volatile phenol determination in wine.

Etievant, P. X.

Journal of Agricultural and Food Chemistry 29 (1) 65-67 (1981) [19 ref. En] [INRA, Lab. de Recherches sur les Aromes, 17, BV 1540, 21034 Dijon Cedex, France]

Volatile phenols present in wine as a result of microbiological processes were determined by studying a red wine that had been manufactured and stored in inert tanks. A 1976 Corbieres wine produced by fermentation of grape juice in contact with solid parts of grapes in inert tanks was extracted with Freon 11. Acidic materials were isolated by extraction with aqueous NaOH, and after reacidification and concentration, volatile phenols were isolated by DEAE-cellulose chromatography and extraction of the eluate with dichloromethane, and were concentrated on a Vigreux column for analysis by GLC/MS. Phenol and 12 phenolic compounds were identified in the red wine, with estimated mean concn. of 8×10^{-4} p.p.m. (4-vinylphenol) to 4×10^{-1} p.p.m. (4-ethylphenol). Min. and max. concn. of each compound in the wine, based on 95% confidence limits for measured levels, are tabulated. Phenols identified were: the cresols; substituted phenols containing 1 or more of the groups methoxy, ethyl, vinyl; and acetovanillone and propiovanillone. Contribution of the volatile phenols to overall wine aroma was not studied, but addition to wine of phenol concentrate to double natural phenolic concn. was detectable by 14 of 16 taste panelists. DIH

1 27

Headspace sampling procedures for onion (*Allium cepa* L.) aroma assessment.

Mazza, G.; LaMaguer, M.; Hadziyev, D.

Canadian Institute of Food Science and Technology Journal 13 (2) 87-96 (1980) [22 ref. En, fr] [Alberta Hort. Res. Cent., Brooks, Alberta T0J 0J0, Canada]

In order to study the effect of cultivation, irrigation, var. and dehydration on onion flavour strength, analytical procedures based on headspace sampling of volatiles were evaluated. A procedure using a porous polymer, Tenax-GC, to concentrate the headspace volatiles by trapping followed by gas chromatography with or without a liquid phase column was found to be most suitable. Reproducibility of the results required standardization of the sampling procedure. Of major importance were the extent of sample disintegration, incubation temp., timing and the rehydration ratio of dehydrated samples. Quantitative data for the volatiles of fresh onion slices were also provided and compared with those dehydrated by a pilot-scale process. AS

1 28

Correlation of objective and subjective measurements of pecan kernel quality.

Forbus, W. R., Jr.; Senter, S. D.; Lyon, B. G.; Dupuy, H. P. *Journal of Food Science* 45 (5) 1376-1379 (1980) [14 ref. En] [USDA Richard B. Russell Agric. Res. Cent., SEA, Athens, Georgia 30604, USA]

Stuart pecan kernels were stored at 21°C, 65% RH, and subjective evaluation and objective measurements of selected quality parameters were made at 3-wk intervals for 12 wk. The subjective evaluations for

aroma and flavour were made by a trained taste panel. Objectively determined data included peroxide values, free fatty acid values, carbonyl factors, Hunter colour values, and results of direct GLC analyses of volatile compounds. GLC analyses were made for total volatiles and for hexanal, dodecane, tridecane, and tetradecane. Correlations between sensory scores and objective measurements for all quality parameters that varied significantly with storage time were determined. Of the parameters evaluated in this study, content of volatiles determined by direct GLC appeared to best indicate pecan kernel quality. The simple linear regressions of flavour score with the logarithm of total volatiles and tridecane content gave correlation coeff. of -0.95 and -0.93, resp. IFT

1 29

The use of porous polymers for the collection of plant volatiles.

Cole, R. A.

Journal of the Science of Food and Agriculture 31 (12) 1242-1249 (1980) [18 ref. En] [Nat. Veg. Res. Sta., Wellesbourne, Warwick CV35 2ES, UK]

Collection of plant volatiles on Porapak Q and Tenax GC and subsequent desorption for GLC was investigated using synthetic mixtures of chemicals similar to those obtained from onion and from cruciferous plants. Comparisons were made of the desorption and elution of volatiles collected from chopped swede and onions. Desorption of volatiles by heating from the porous polymers was more effective than eluting, and Tenax GC was found to be the more effective porous polymer for collecting compounds with retention times > 9 min on a Carbowax 20M column, as from crucifers. Porapak Q was preferable for collecting compounds with retention times < 9 min, as from onions. A canonical variate analysis made a comparison of the 'odour profiles', obtained by different methods, simple and easy. The volatiles collected from both intact and chopped plants were comparable with those identified in solvent extracts of macerated plants. AS

1 30

Isolation and identification of volatile compounds from baked potatoes.

Coleman, E. C.; Ho, C.-T.; Chang, S. S.

Journal of Agricultural and Food Chemistry 29 (1) 42-48 (1981) [16 ref. En] [Dep. of Food Sci., Cook Coll., Rutgers, State Univ. of New Jersey, New Brunswick, New Jersey 08903, USA]

The volatile flavour components were isolated from 540 lb of Idaho Russet Burbank baked potatoes. Extensive gas chromatographic analysis yielded 420 fractions. The odour of each chromatographic fraction was evaluated, and the fractions were identified by IR and MS. A total of 228 compounds was identified. The compounds identified in the volatiles of baked potatoes included hydrocarbons, acids, alcohols, aldehydes, esters, lactones, ethers, furans, halogenated hydrocarbons, ketones, pyrazines, oxazoles, thiazoles, and miscellaneous heterocycles. The most important compounds in baked potato flavour are the pyrazines, oxazoles, thiazoles, and a furanone. AS

131

Halogen compounds identified in the volatile constituents of baked potatoes.

Ho, C.-T.; Coleman, E. C.

Journal of Agricultural and Food Chemistry 29 (1) 200-201 (1981) [18 ref. En] [Dep. of Food Sci., Cook Coll., Rutgers, State Univ. of New Jersey, New Brunswick, New Jersey 08903, USA]

During a study of volatile constituents of baked Idaho Russet Burbank potatoes [see preceding abstr.] by repetitive gas chromatography 14 halogenated compounds were identified. The compounds, tabulated with mass fragmentation data, are mono-, di- and trichloroalkanes, tetrachloroethylene, chloroanilines,

trichloroacetic acid, 2-chlorobiphenyl and bromo- and iodoalkanes. The compounds are assumed to result from action of heat on pesticide residues in potatoes.

DIH

132

Mushroom flavour. [Review]

Maga, J. A.

Journal of Agricultural and Food Chemistry 29 (1) 1-4 (1981) [54 ref. En] [Colorado State Univ., Dep. of Food Sci. & Nutr., Fort Collins, Colorado 80523, USA]

After a brief discussion of classes of compounds identified as contributing to mushroom flavour, this review concentrates on volatile compounds, approx. 150 of which have been identified in mushrooms, and especially on a series of C8 compounds thought to constitute the primary volatiles of mushroom flavour. Other aspects considered are influence of drying or cooking on volatile composition and sensory properties of mushroom volatiles. DIH

133

Lipase production, lipolysis, and formation of volatile compounds by *Pseudomonas fluorescens* in fat containing media.

Andersson, R. E.

Journal of Food Science 45 (6) 1694-1701 (1980) [36 ref. En] [SIK - Swedish Food Inst., Box 27022, S-400 23 Göteborg, Sweden]

The lipolytic bacterium *P. fluorescens* was cultivated in nutrient broth supplemented either with olive, sunflower or soy oil. Presence of oil delayed bacterial growth and lipase production, but the finally obtained cell density and amount of lipase was approx. the same as in unsupplemented nutrient broth. The lipase hydrolysed soy oil to a greater extent than olive and sunflower oils. Fatty acids were broken down into volatile compounds which were detected in the headspace gas over the fat-containing media. The volatile fraction was found to contain alcohols, aldehydes, ketones, esters, furans, S compounds and hydrocarbons. IFT

134

Correlation of gas liquid chromatographic volatiles with flavour intensity scores of stored sunflower oils.

Morrison, W. H., III; Lyon, B. G.; Robertson, J. A.

Journal of the American Oil Chemists' Society 58 (1) 23-27 (1981) [19 ref. En] [Richard B. Russell Agric. Res. Cent., USDA, PO Box 5677, Athens, Georgia 30613, USA]

Samples of sunflower salad oil from seed produced in the northern USA containing butylated hydroxyanisole, butylated hydroxytoluene, tert-butylhydroquinone and propyl gallate antioxidants were stored in flintglass and amber bottles in the presence and absence of light for 16 wk. Using Dupuy's direct GLC method, correlations were made between pentane content and flavour intensity scores and total volatiles and flavour intensity scores as well as flavour intensity values (FIV) [see FSTA (1971) 3 8N345]. Samples stored in clear bottles exposed to light had higher scores and pentane content than those stored in amber bottles or in the dark. Peroxide values were highest for samples stored in amber bottles. High correlation was found between flavour intensity scores and pentane and between pentane and FIV for rancid and painty flavour

descriptors. Indications from the chemical and sensory data suggested that addition of antioxidants had little effect on flavour scores when the oil was stored in the absence of light. AS

135

Recent advances in the study of aroma compounds of milk and dairy products

Badings, H. T.; Nester, R.

Netherlands Milk and Dairy Journal 34 (1) 9-30 (1980) [143 ref. En, nl] [Netherlands Inst. for Dairy Res. (NIZO), Ede, Netherlands]

See FSTA (1979) 11 6P1051.

136

Perfumery and flavor materials. [Review]

Bedonkian, P. Z.

Perfumer & Flavorist 5 (2) 1, 3-6, 8-10, 13-16, 18-22 (1980) [264 ref. En] [Bedoukian Res. Inc., Danbury, Connecticut, USA]

The 36th annual review contains sections on flavour research (fruits; vegetables; furans; furanones and pyrazines; coffee, tea, cocoa; meat flavour), aroma chemicals, patents and reports on new aroma chemicals, reviews and books. RM

137

Study of essential oil of *Salvia officinalis* growing in Egypt.

Karawya, M. S.; El-Hawary, S. S.

Egyptian Journal of Pharmaceutical Sciences 19 (1/4) 301-305 (1978) [10 ref. En, ar] [Dep. Pharmacognosy, Cairo Univ., Cairo, Egypt]

Steam distilled oil from *Salvia officinalis* leaves collected from winter plants (used as a flavouring) was analysed by GLC and gas chromatography/MS, and tentative identification of oil constituents was made by comparing MS data with a standard; confirmation was obtained by TLC and relative retention time data. The oil was rich in ketones (thujone 45.7% and camphor 23.6%); monoterpene hydrocarbons and 1,8-cineole were also located (10.97 and 9.10%, resp.); alcohols and sesquiterpenes made up a small % of the oil (1.70 and 2.25%, resp.). LH

138

Inlet system for direct gas chromatographic and combined gas chromatographic/mass spectrometric analysis of food volatiles.

Legendre, M. G.; Fisher, G. S. (United States of America, Secretary of Agriculture)

United States Patent 4 245 494 (1981) [En]

139

Volatile nitrosamines in food.

Spiegelhalder, B.; Eisenbrand, G.; Preussmann, R. *Oncology* 37 (4) 211-216 (1980) [15 ref. En] [German Cancer Res. Cent., Inst. of Toxicology & Chemotherapy, Heidelberg, Federal Republic of Germany]

A selection of 2826 food samples (including meat and meat products, cheese and beer), representing average Federal German consumption, was analysed for nitrosamines. 3 nitrosamines were found consistently (*N*-nitroso-dimethylamine, NDMA; *N*-nitroso-pyrrolidine, NPYR; and *N*-nitrosopiperidine, NPIP); NPYR and NPIP were found at concn. > 0.5 µg/kg in only 3 and 2% of samples, resp. NDMA was detectable in 30% of samples, 6% containing > 5 µg/kg. Average daily male intake of NDMA was 1.1 µg, about 64% of which came from beer (and can be eliminated by adjusting the kilning of the malt), and only 10% from cured meat. Changes in concn. of NDMA in beer during various brewing stages and in malt during kilning are tabulated. LH

140

Isolation of volatiles from packaging materials and their separation with gas chromatography.

Kaminski, E.; Wasowicz, E.; Przybylski, R.; Szebiotko, A.; Zawirska, R.

Acta Alimentaria Polonica 6 (3) 173-181 (1980) [5 ref. En, pl] [Dep. of Food Tech. of Plant Origin, Agric. Univ., Poznan, Poland]

Isolation of volatiles from various food packaging materials was carried out by head space analysis and distillation-extraction methods. Separation of the volatile components was performed in a gas chromatograph. AS

141

Isolation and identification of volatile compounds in cooked meat: sukiyaki.

Shibamoto, T.; Kamiya, Y.; Mihara, S.

Journal of Agricultural and Food Chemistry 29 (1) 57-63 (1981) [46 ref. En] [Dep. of Environmental Toxicology, Univ. of California, Davis, California 95616, USA]

The sukiyaki volatiles obtained from beef, heated with vegetables and seasonings (sugar and soy sauce) under simulated cooking conditions [blended samples heated in sealed flasks at 100°C for 12 h], were isolated and identified by GLC/MS. 44 compounds were positively identified. This included furans, ketones, aldehydes, esters, acids, alcohols, pyrazines, hydrocarbons, and pyrroles. Dimethylnitrosamine was

identified at a level of 0.02 parts/10⁹ in the dichloromethane extract of the bove sukiyaki broth by using a thermal energy analyser (TEA) combined with a gas chromatograph. AS

142

[Gas chromatographic determination of volatile nitrogenous bases isolated from foods by the Conway microdiffusion method.]

Zhuravleva, I. L.; Golovnya, R. V.; Palamarchuk, L. F.; Kishkovskii, Z. N.

Zhurnal Analiticheskoi Khimii 35 (1) 167-170 (1980) [5 ref. Ru, en] [Inst. Elementoorganicheskikh Soedinenii AN SSSR, Moscow, USSR]

Volatile nitrogenous bases in young sherry-type wines with a yeast flor (strain V-41) were analysed by separation by Conway microdiffusion and subsequent gas chromatography. The method revealed the presence of 26 volatile N compounds with b.p. up to 230°C. STI

143

[Influence of the aromatic fraction on the stability of concentrated orange juice during refrigerated storage.]

Lafuente, B.; Gasque, F.; Izquierdo, L.; Nadal, M. I.; Navarro, J. L.

Revista de Agroquímica y Tecnología de Alimentos 20 (4) 531-536 (1980) [6 ref. Es, en] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

The effects of adding recovered aroma volatiles to orange concentrates (60°Brix) before or after storage at 0-2°C were studied. Tabulated results showed significant drops in organoleptic acceptance of products stored 2, 4 or 6 months with added aroma, compared with addition immediately before tasting. This adverse effect could not be masked by incorporation of essential oil. GLC revealed some changes in composition of the product stored with recovered aroma volatiles and essential oil, notably reduction in limonene and increase in terpinolene and α-terpineol concn. RM

144

Identification of intermediates in the formation of onion flavor.

Yagami, M.; Kawakishi, S.; Namiki, M.

Agricultural and Biological Chemistry 44 (11) 2533-2538 (1980) [10 ref. En] [Dep. of Food Sci. & Tech., Fac. of Agric., Nagoya Univ., Chikusa, Nagoya 464, Japan]

Senshu-yellow onion cv. were (i) cubed or (ii) homogenized, incubated at room temp. for 30 min in a stoppered vessel, and 2 ml of headspace gas were removed for GLC analysis; subsequently isopropyl ether was added to each vessel, the mixture was shaken for 1-2 h, and the ether layer separated, washed and dried to approx. 1 ml in a rotary evaporator. Cysteine derivatives were prepared from onion extracts by Luke's method [FSTA (1971) 3 10]1285 and isolated by TLC. Benzyl mercaptan derivatives were also prepared and studied by HPLC and TLC. Major GLC peaks were obtained for (i) onion corresponding to propyl disulphide and 1-propenyl propyl disulphide, whereas these peaks were small in GLC of (ii) onions unless they

had been treated with NaBH_4 . Differences in ether extracts of (i) and (ii) could also be minimized by adding NaBH_4 to (ii). This reaction indicated the formation of intermediates, producing flavour with NaBH_4 . Compounds isolated were propyl propanethiosulphonate, propanal and thiopropanal S-oxide. LH

145

Volatile flavor components of wood apple (*Feronia limonia*) and a processed product.

MacLeod, A. J.; Pieris, N. M.

Journal of Agricultural and Food Chemistry 29 (1) 49-53 (1981) [12 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Univ. of London, Campden Hill Road, London, W8 7AH, UK]

Wood apple, a tropical fruit, and its canned processed product (wood apple cream) have recently become economically important in Sri Lanka; this study was designed to characterize for the 1st time the volatile flavour components of fruit and product and identify components contributing significantly to their characteristic flavour. Volatiles were extracted using a Likens & Nickerson apparatus, as modified by MacLeod & Cave [see FSTA (1975) 7 10Q152] using trichlorofluoromethane as solvent. Extracts were concentrated by low-temp/high vacuum distillation and were examined by GLC on 100 ft open tubular stainless steel or 44 m glass capillary columns coated with OV101. GLC peaks were characterized by MS, using both electron impact and chemical ionization. Wood apple fruit essence contained 46 main components, of which 26 (comprising approx. 96% of total volatiles) were identified. Wood apple cream essence contained 50 main components, of which 33 (97% of sample) were identified. Odour quality of individual components was assessed at a GLC odour port. Peaks having a definite wood apple quality were methyl and ethyl hexanoate, ethyl 3-hydroxyhexanoate and butanoic acid. These were present in high concn. in fruit and cream. The majority of compounds identified were esters (46 and 40% of fruit and cream volatiles, resp.), with the major component being ethyl butanoate (25% of volatiles, corresponding to approx. 21 mg/kg fruit and 4.4 mg/l cream). Overall the cream possessed the same volatiles as the fruit, in the same relative proportions, but all were present at lower concn. in the cream. Despite the presence in the cream of compounds such as furfural, presumably as artifacts of processing, it reflected the flavour of apple wood fruit and was considered a good quality product. Two series of related compounds were identified in wood apple volatiles, based on C4 and C6 parent compounds. These were butanoic acid, butan-1-ol, the methyl and ethyl esters of butanoic, but-2-enoic and 3-hydroxybutanoic acids, and the corresponding C6 compounds. These 2 series of compounds made up approx. 70% of wood apple volatiles. Esters of β -hydroxy acids may be a characteristic class of tropical fruit aroma volatiles. DIH

146

Analysis of volatile compounds in wheat germ oil responsible for an aggregation response in *Trogoderma glabrum* larvae.

Nara, J. M.; Lindsay, R. C.; Burkholder, W. E.

Journal of Agricultural and Food Chemistry 29 (1) 68-72 (1981) [32 ref. En] [Dep. of Entomology, Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

During a study of response of stored product insect larvae to components of wheat germ oil, composition of wheat germ oil steam distillate was studied by GLC. Primary separation was on Carbowax 20M (typical chromatogram illustrated), and selected fractions were rechromatographed using nonpolar stationary phases (SE30 or OV101). Some of the peaks were identified by MS and comparison with authentic samples.

Identifications and retention indices of the compounds are tabulated, and aggregation responses of *T. glabrum* larvae to these and other compounds are described. Major compounds identified included C13-C16 saturated and unsaturated hydrocarbons, a branched hexylbenzene, octanoic acid, γ -nonalactone, substituted naphthalenes and a cyclic branched ketone. DIH

147

N-nitrosodimethylamine in dried dairy products.

Libbey, L. M.; Scanlan, R. A.; Barbour, J. F.

Food and Cosmetics Toxicology 18 (5) 459-461 (1980) [12 ref. En] [Dep. of Food Sci. & Tech., Oregon State Univ., Corvallis, Oregon 97331, USA]

7 dried skim milks and 2 dried buttermilks purchased from local retail outlets were analysed for volatile nitrosamines using a chemiluminescence detector. 50 g of sample and 70 ml of mineral oil were used in the vacuum distillation procedure. The distillate extracts were quantitatively analysed on a gas chromatograph interfaced to a thermal energy analyser (GC-TEA). N-nitrosodimethylamine (NDMA) the only volatile nitrosamine that could be confirmed to be present by MS, was detected in 8 out of 9 samples analysed. The mean level of NDMA for all samples was 1.9 parts/10⁶, and the range was 0-4.5 parts/10⁶. NDMA was confirmed by MS in 5 of the samples. The study indicates that the presence of low levels of NDMA in dried dairy products may be general. VJG

148

Survey of fluid and nonfat dry milks for N-nitrosamines.

Lakritz, L.; Pensabene, J. W.

Journal of Dairy Science 64 (3) 371-374 (1981) [17 ref. En] [E. Reg. Res. Cent., USDA, Philadelphia, Pennsylvania 19118, USA]

A limited survey of milk and milk products was undertaken to determine the presence of volatile N-nitrosamines, a class of compounds carcinogenic to a broad range of animal species. Nitrosamines were detected and estimated by GLC interfaced with a Thermal Energy Analyzer. Detectable N-nitrosodimethylamine, the only nitrosamine found, ranged from 0.05 $\mu\text{g/kg}$ for whole milk to 0.30 $\mu\text{g/kg}$ for dried skim milk. No N-nitrosodimethylamine was detected in raw milk, whereas 11 of 21 samples of pasteurized milk contained apparent N-nitrosodimethylamine (mean 10 $\mu\text{g/kg}$). N-nitrosodimethylamine was also detected, but not confirmed by mass spectrometry, in evaporated and condensed milk with means 0.32 and 0.58 $\mu\text{g/kg}$ and in 9 of 10 dried skim milk samples with a mean of 1.69 $\mu\text{g/kg}$. Upon reconstitution, condensed milk and dried skim milk contained N-nitrosodimethylamine comparable with that in pasteurized milk. No N-nitrosodimethylamine was detected in cultured milk products such as buttermilk and yoghurt. AS

1 4 9

[Lactones and cheese.]

Dimeco, M. de; Langlois, D.; Kuzdzal-Savoie, S.
Technique Laitiere No. 928, 30-32 (1979) [16 ref. Fr]
 [Lab. de Biochim. Microbienne, INRA, 78350 Jouy-en-Josas, France]

The natural properties and origin of lactones in milk, butter and cheeses, their organoleptic effects, and methods for their determination are reviewed. A 200-g sample of Roquefort cheese was examined for lactones by the methods of Ellis Wong [FSTA (1976) 8 2G105 & 5P874] using some additional purification procedures. The GLC chromatograph is presented; it includes peaks, identified as representing C14, C16, and C18 δ -lactones. The paper is an excerpt from a thesis by the 1st author; a photocopy of the full text dealing with free volatile and aromatic fatty acids, methylketones and lactones of cheeses can be obtained from INRA, price 60F. SKK

1 5 0

The production of selected compounds in a Swiss-type cheese and their contribution to cheese flavour.
 Mitchell, G. E.

Australian Journal of Dairy Technology 36 (1) 21-25 (1981) [20 ref. En] [Otto Madsen Dairy Res. Lab., Hamilton, Queensland 4007, Australia]

High moisture Swiss cheese was sampled at intervals during a 3 months ripening period, and analysed for acetic, butyric and propionic acids, proline and diacetyl contents and flavour. Cheeses with a characteristic Swiss-type flavour contained 38-120 mg acetic acid, 417-555 mg propionic acid, ≤ 5 mg butyric acid and 115-215 mg proline/100 g. No simple relationship was found between diacetyl content and flavour score. Mixtures of the 3 flavour components were added to a processed cheese spread base in an attempt to simulate a synthetic Swiss cheese flavour. A mixture containing 50 mg acetic acid, 500 mg propionic acid and 125 or 150 mg proline/100 g cheese gave a characteristic Swiss-type cheese flavour, but not the flavour of a high quality cheese. Other components must also be involved in the flavour of Swiss cheese. MEG

1 5 1

[Method for trapping volatile components of food.]

Iida, H.; Nakamura, K.; Tokunaga, T.; Miwa, K.
Bulletin of the Tokai Regional Fisheries Research Laboratory [Tokai-ku Suisan Kenkyusho Kenkyu Hokoku] No. 93, 87-94 (1978) [14 ref. Ja, en]

A procedure for collection of volatile odour compounds from fishery products is described. Synthetic air is purified by passing through an activated C column and through a U-tube packed with molecular sieve 5A cooled in liquid O₂. The purified synthetic air is then passed over the sample under test, after which the volatiles are trapped in U-tubes cooled with liquid O₂, and may subsequently be analysed by GLC. Applications considered include detection of dimethyl sulphide and dimethyl disulphide in the odour of deteriorated salted herring roe, and detection of residual solvent (n-hexane, propan-2-ol) in fish meal. MS analysis of the volatiles is also discussed. [From En summ.] AJDW

1 5 2

Some sulfur containing compounds in cooked odor concentrate from boiled Antarctic krills (*Euphausia superba* Dana).

Kubota, K.; Kobayashi, A.; Yamanishi, T.
Agricultural and Biological Chemistry 44 (11) 2677-2682 (1980) [15 ref. En] [Lab. of Food Chem., Ochanomizu Univ., Bunkyo-ku, Tokyo 112, Japan]

27 one-kg frozen krill samples, each in 1 l of water, were subjected to simultaneous distillation and extraction in a modified Likens & Nickerson apparatus [Journal of Chromatography (1966) 21, 1]. The 27 ether extracts were combined and dried. The extract weighed 187 mg and had a typical cooked krill odour. GLC (with various trapping methods), gas chromatography-MS, IR and NMR analyses were done on the extract, and 7 S-containing compounds were newly located, 4 of which contained N also. These compounds are important contributors to krill odour, forming trithiolane and thialdine derivatives on cooking. LH

1 5 3

[Lipid oxidation at low-intermediate moisture content. II. The correlation between the common lipid oxidation measurements and the volatile compounds.]

Mizushima, Y.; Takama, K.; Zama, K.
Bulletin of the Faculty of Fisheries, Hokkaido University [Hokkaido Daigaku Suisangakubu Kenkyu Iho] 30 (2) 172-179 (1979) [13 ref. Ja, en] [Lab. of Food Chem., Fac. of Fisheries, Hokkaido Univ., Minato-cho, Hakodate 041, Japan]

The volatile compounds appearing in the process of oxidation of mackerel oil were studied in a model system consisting of egg albumin. Propanal, one of the major volatile components, was identified by gas chromatography-MS analysis. Propanal formation was highly correlated with carbonyl value (COV), oxodiene value, and conjugable oxidation products ratio. Additionally, formations of some major hydrocarbons (not identified) were also highly correlated with COV. It is concluded that the measurement of volatile compounds formed, especially propanal, would be a useful index of lipid oxidation. [See preceding abstr. for part I and FSTA (1981) 13 1R8 for part III.] AS

1 5 4

[Comparison of some porous polymers as absorbents for collection of odour samples and the application of the technique to an environmental malodour.

Barnes, R. D.; Law, M. L.; MacLeod, A. J.
Analyst 106 (1261) 412-418 (1981) [18 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Univ. of London, Campden Hill Road, London W8 7AH, UK]

A range of Chromosorbs and Tenax-GC were compared with regard to their efficiency as adsorbents for volatile odorous compounds, using a very simple model system. When desorption was accomplished by solvent elution using acetone, Chromosorb 103 provided the best recoveries of those investigated (between 90 and 95%). In situations where thermal lability of trapped compounds is not a problem, use of Tenax-GC and thermal desorption at about 250°C would be recommended on the basis of this survey, during which this approach consistently provided recoveries > 96% from small sample vol. The latter

procedure was applied to analysis of an industrial malodour from an animal rendering factory, and using gas chromatography-MS > 35 compounds (92% of the total odour sample) were positively identified. In particular, a range of alkylthiophenes may be characteristic of this particular odour. AS

155

Evaluation of the contribution of flavor volatiles to the aroma of beef by surface response methodology. Bodrero, K. O.; Pearson, A. M.; Magee, W. T. *Journal of Food Science* 46 (1) 26-31 (1981) [28 ref. En] [Dep. of Food Sci. & Human Nutr., Michigan State Univ., E. Lansing, Michigan 48824, USA]

The contribution to beef aroma of 51 compounds previously identified in the flavour volatiles from cooked beef was estimated by surface response methodology. In general, heterocyclic compounds containing O₂, N₂ and/or S and unsaturated alcohols gave higher predicted scores and had lower optimum concn. than ketones, aldehydes, alkanes or saturated alcohols. It was further demonstrated that hydrophilic compounds are more likely to contribute to meat aroma than hydrophobic compounds, thus, verifying a more important role for water-soluble compounds in contributing to meat flavour. On testing mixtures of compounds, the optimum concn. were generally lower, but there was a greater range in max. scores. Special significance is given to the fact that the highest scoring 2-component mixture (2-acetyl-3-methylpyrazine and H₂S) resulted from combining the 2 single compounds that scored highest alone. Furthermore, the reaction mixture of H₂S with 4-hydroxy-5-methyl-3(2H)-furanone gave the highest predicted score in the entire study. Thus, results indicate that the surface response method offers promise for unravelling the complexity of the meat flavour system. IFT

156

[Minor components in natural flavours and fragrances.] [Review]

Peyron, L.

Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici, Aerosol 62 (3) 143-157 (1980) [6 ref. Fr, it, en, de, es] [Lautier Aromatiques, Grasse, France]

This review discusses the minor components in natural flavours, and classifies them by their chemical structure. The correlation between structure and organoleptic properties is discussed. Different types are studied according to their origin (naturally present, formed in complex natural media, synthetic but identical with natural compounds) with the aid of many examples: minor components in pears, fresh tomatoes and concentrate, cheese, fermented beverages, tea, beer, bread, cocoa, coffee, and cooked meats. RM

157

Minor components in natural flavors and fragrances. Peyron, L.

Perfumer & Flavorist Special issue, pp. 61-64, 67-70, 72-78 (1980) [many ref. En] [Lautier Aromatiques, Paris, France]

The importance of the organoleptic contribution of minor flavour components is reviewed. Structural types

are classified and the relation of structure or physicochemical properties with sensory properties discussed. Minor odoriferous, bitter and sweet components are separately indexed according to their chemical systems. Some representative examples are listed. Minor components typed by origin (i.e. naturally present, created from complex natural media), the contribution of enzyme processes, thermal processes and miscellaneous processes, as well as synthetic minor components identical with natural substances are discussed. RM

158

Application of gas-liquid chromatography to the analysis of essential oils. VIII. Fingerprinting of essential oils by temperature-programmed gas-liquid chromatography using methyl silicone stationary phases.

United Kingdom, Chemical Society, Analytical Methods Committee

Analyst 106 (1261) 448-455 (1981) [1 ref. En]

Problems of obtaining reproducible results in the fingerprinting of essential oils by temp. programmed GLC were examined and reported in Part VII [see FSTA (1980) 12 11T579]. That report was concerned both with general problems and with the specific use of a polar stationary phase, i.e. Carbowax 20M. This report is concerned with the use of non-polar stationary phases of the methyl silicone type and the application of the method of column standardization described in Part VII. A collaborative study with methyl silicone stationary phases and a specification of 'g-pack values' for the column packing has resulted in the production of a method that yields reproducible relative retention indices for the test substances limonene, acetophenone, linalol, naphthalene, linalyl acetate and cinnamyl alcohol and has been applied with satisfactory results to oils of bergamot, Jamaican ginger, Nigerian ginger, West Indian nutmeg and East Indian nutmeg. A recommended method is given for the reproducible temp. programmed GLC fingerprinting of essential oils when methyl silicone stationary phases are used. [See following abstr. for part IX.] AS

159

The application of gas chromatography to food analysis. [Review]

Dickes, G. J.

Talanta 26 (12) 1065-1099 (1979) [518 ref. En] [Avon County Lab., 7 Redcross Street, Bristol, UK]

The literature on applications of gas chromatography to food analysis since 1974 is reviewed, as a supplement to the reviews of earlier applications presented in book form [see FSTA (1977) 9 8A532, 8A533]. The review is divided into 4 parts, dealing respectively with the influence of food analysis on gas chromatographic technique, the detn. of those compounds naturally present in foods and used to give an assessment of quality, the detn. of food additives and contaminants, and a brief conclusion. JRR

160

Food. [Review]

Sloman, K. G.; Foltz, A. K.; Yeransian, J. A.
Analytical Chemistry 53 (5) 242R-273R (1981) [1319
 ref. En] [General Foods Tech. Cent., White Plains, New
 York 10625, USA]

This review of analytical procedures for food covers
 the literature from Oct. 1978-Oct. 1980. It deals with:
 additives; adulteration, contamination and
 decomposition; carbohydrates; colours; enzymes; fats,
 oils, and fatty acids; flavours and volatile compounds;
 identity of foods; inorganic analysis; moisture; organic
 acids; N; vitamins; and miscellaneous. AL

161

Use of gas-liquid chromatography in analysis of
 foods.]

Chuguenot, J.-C.; Baron, C.

Annales des Falsifications et de l'Expertise Chimique
 73 (787) 351-365 (1980) [13 ref. Fr, en] [Lab. de
 Biochimie Appliquee, ENSBANA, Campus Univ., 21100
 Dijon, France]

Factors influencing GLC methodology are discussed
 in some detail for the following specific examples:
 analysis of essential oils of lemon and vanilla extracts
 (choice of column and stationary phase), and analysis of
 organophosphorus pesticides (choice of mode of
 detection). Details are also given for quantitative detn.
 of thiabendazole in grapefruit peel, after preparation of
 the methylated derivative. DIH

162

[Flavour of miso.] [Review]

Yasuhira, H.

*Journal of the Society of Brewing, Japan [Nihon Jozo
 Kyokai Zasshi]* 75 (6) 506-515 (1980) [40 ref. Ja]
 [Shinshu Miso Res. Inst., Nagano, Japan]

163

[Effect of fermentation of must on composition of
 volatile compounds in wine.]

Kozub, G. I.; Mamakova, Z. A.; Skorbanova, E. A.;

Andronova, N. F.

Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii
 35 (10) 30-33 (1980) [Ru] [Moldvinprom, Kishinev,
 USSR]

The optimal fermenting temp. was sought for
 manufacture of sherry-type wines, using changes in the
 volatile compounds of Aligote musts with 16.2 and
 18.3 g sugar/100 ml, and titratable acidities of 10.1 and
 11.3 g/l. The relationship between concn. of secondary
 fermentation products (acetaldehyde, 2,3-butenylene
 glycol, diacetyl, and ethyl esters of acetic acid, caproic
 acid etc.) and temp. was also studied. The acetaldehyde
 concn. dropped from the original level of 81 mg/l to a
 min. of 61.5 mg/l when the fermentation temp. rose
 from 10° to 20°C. Neither esters nor the higher alcohols
 changed uniformly and unequivocally. The absolute
 values of the basic secondary fermentation products
 and their ratios were found to be important indicators
 of wine quality. Temp. of 20-25°C are recommended for
 manufacture of sherry-type wines. STI

164

[Coulometric titration of SO₂ in wine.]

Villeton-Pachot, J. P.; Persin, M.; Gal, J. Y.

Analisis 8 (9) 422-427 (1980) [8 ref. Fr, en] [USTL,
 Place E.-Bataillon, 34060 Montpellier Cedex, France]

Potentiometric and amperometric detection of the
 end point of SO₂ analysis by iodometry were compared
 with visual end-point detection by starch. Results,
 shown graphically and in tables, revealed that
 coulometric generation of iodine could be combined
 with amperometric detection of end point, and operate
 with small samples of wine (0.5 ml) with 80-120 s
 coulometry at 1 mA. This allows detn. of free SO₂ in the
 same reagent mixture, with a coeff. of variation of 0.6-
 0.7%. The method can be partly automated at low cost
 to perform 25 analyses/h (with manual sample
 preparation). RM

165

[Flavour of wine.] [Review]

Ueno, K.; Matsumoto, N.; Takeuchi, K.; Togawa, H.

*Journal of the Society of Brewing, Japan [Nihon Jozo
 Kyokai Zasshi]* 75 (6) 492-498 (1980) [26 ref. Ja]
 [Mann's Wine Co. Ltd, Katsunuma, Japan]

166

[Substances imparting the typical aroma to wines and
 brandies.]

Pisarnitskii, A. F.; Rodopulo, A. K.; Egorov, I. A.;

Egofarova, R. Kh.

Vinodelie i Vinogradarstvo SSSR No. 3, 30-32 (1980)
 [Ru] [Inst. Biokhimii im. A. N. Bakha AN SSSR, USSR]

Contents of aroma compounds (volatile phenols,
 saccharide decomposition products, terpenes, lactones)
 were determined in white table wines, fruit wines,
 sherry, brandies. Utilization of the data to enhance the
 aroma of the individual types of beverage is discussed.
 Disruption of the alcohol fermentation process caused
 retention of the terpenes; volatile phenols content could
 be increased by fermentation "on-stem" and by ageing
 in oakwood containers; and decomposition could be
 intensified by protracted ageing or heat processing.
 STI

167

[Flavour of brandy.] [Review]

Nishimura, K.

*Journal of the Society of Brewing, Japan [Nihon Jozo
 Kyokai Zasshi]* 75 (6) 485-491 (1980) [68 ref. Ja]
 [Suntory Co. Ltd., Shimamoto-cho, Mishima-gun,
 Osaka-fu, Japan]

Brandy flavour components originating from yeasts,
 grape processing, and ageing are reviewed. YN

168

[Flavour of whisky.] [Review]

Masuda, M.; Sugibayashi, K.

*Journal of the Society of Brewing, Japan [Nihon Jozo
 Kyokai Zasshi]* 75 (6) 480-484 (1980) [67 ref. Ja]
 [Suntory Co. Ltd., Shimamoto-cho, Mishima-gun,
 Osaka-fu, Japan]

169

[Flavour of shochu. I. Characteristics and components.] [Review]

Nishiya, T.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 75 (8) 641-649 (1980) [51 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

170

Volatile constituents of green tea, Gyokuro (*Camellia sinensis* L. var. Yabukita).

Yamaguchi, K.; Shibamoto, T.

Journal of Agricultural and Food Chemistry 29 (2) 366-370 (1981) [15 ref. En] [Dep. of Environmental Toxicology, Univ. of California, Davis, California 95616, USA]

The volatile constituents of Gyokuro, which had not been studied prior to this report, were investigated by gas chromatography/MS. 79 compounds were positively identified and 10 compounds were tentatively identified in the oil obtained from a methylene chloride extract of the steam distillate of the green tea leaf. The compounds reported here include 17 hydrocarbons, 17 alcohols, 16 aldehydes, 13 ketones, 8 esters, 2 ethers, 1 acid, and 5 others. Major constituents of this oil were identified as 2,6,6-trimethyl-2-hydroxycyclohexanone, linalool, geraniol, *cis*-jasmone, β -ionone, cyclohexanone, 5,6-epoxy- β -ionone, indole, and caffeine. AS

171

[Formation of aroma compounds in roasted coffee.] Artem'ev, B. V.

Izvestiya Vysshikh Uchebnykh Zavedenii,

Pishchevaya Tekhnologiya No. 2, 55-57 (1980) [5 ref. Ru] [Moskovskii Kooperativnyi Inst., Moscow, USSR]

The balance method (described, with numerous mathematical formulae) was used to evaluate changes in contents of aroma compounds in roasted ground coffee; the method allows for variation in the contents due to loss of volatile substances and other processes. Using a gas extraction technique, it was seen that the concn. of aroma compounds in the ground coffee was 33 and 18.3 $\mu\text{g/g}$ before and after extraction, resp. The concn. in the coffee beverage contained 2140 $\mu\text{g/g}$ aroma substances, reduced to only 2132 $\mu\text{g/g}$ after distillation. The analytical method used showed that roasted ground coffee can produce considerable amounts of aroma substances when converted into a hot beverage. STI

172

[Quantitative determination of volatile compounds in wine and brandy by capillary chromatography.]

Khabakhov, T. S.

Sadovodstvo, Vinogradarstvo i Vinodelie Moldavii 35 (12) 26-28 (1980) [Ru] [Vserossiiskii Nauchno-issled. Inst. Vinogradarstva i Vinodeliya im. Ya. I. Potapenko, Novocheerkassk, USSR]

Rapid gas chromatographic analysis of volatile compounds was improved to enable them to be determined in distillates and wine by applying the

sample directly into the column. The max. temp. of stationary phase was increased to 150°C, the column vol. was reduced, and the gas carrier stream was divided; acetone, n-pentanol and octanol are used as standards. The method, which is simple and accurate, permits simultaneous detn. of a wide range of constituents. STI

173

Bananas - physiology and biochemistry of storage and ripening for optimum quality. [Review]

Marriott, J.

CRC Critical Reviews in Food Science and Nutrition 13 (1) 41-88 (1980) [287 ref. En] [Tropical Products Ltd, 56-62 Grays Inn Rd., London, UK]

Bananas (*Musa* spp.) are a major food crop of the humid tropics, and though edible cv. are diverse and numerous, most of our knowledge of the physiology and biochemistry of these fruits relates to a few dessert cv. of the AAA type, mainly of the Cavendish subgroup which dominate the export trade between tropical and temperate zones. The preclimacteric period of banana fruits after harvest determines their transportability, and its duration is very sensitive to changes in fruit maturity, storage temp., ethylene concn., and other factors; progress in measurement and resolution of each of these effects is described. Changes in composition of the ripening fruits, especially in the development of flavour volatiles, are reviewed. Progress in understanding the integration of the biochemical changes controlling ripening in banana fruits is discussed. Recent work on storage, ripening, and factors relating to sensory assessment of fruit quality is discussed for cv. of *Musa* types not used in major export trades. AS

174

Paper chromatographic determination of total capsaicinoids in capsicums and their oleoresins with precision, reproducibility, and validation through correlation with pungency in Scoville Units.

Rajpoot, N. C.; Govindarajan, V. S.

Journal of the Association of Official Analytical Chemists 64 (2) 311-318 (1981) [21 ref. En] [Cent. For Food Tech. Res. Inst., Mysore 570 013, India]

Total capsaicinoids is an important quality index of capsicums. It has been recommended that this index can be reliably estimated by a simple and rapid paper chromatographic method. Details of the method have been critically studied to establish the precision and reproducibility. Repeatability and reproducibility of the method were $\pm 3.12\%$ and $\pm 6.63\%$ (relative to mean), resp. In addition, the values by this method for samples of capsicums and their oleoresins, varying over a wide range of capsaicinoids content, were validated by a high correlation (r approx. = 1) to pungency values by the standardized threshold dilution method. In the light of the results presented, it is suggested that the total capsaicinoids be accepted as an index of pungency. AS

175

Volatile flavor compounds of matsutake-*Tricholomam matsutake* (Ito et Imai) Sing.

Yajima, I.; Yanai, T.; Nakamura, M.; Sakakibara, H.; Hayashi, K.

Agricultural and Biological Chemistry 45 (2) 373-377 (1981) [14 ref. En] [Kawasaki Res. Lab., T. Hasegawa Co., 335 Kariyado, Kawasaki 210, Japan]

Volatile flavour compounds in the headspace vapours of fresh matsutake were (i) absorbed on Porapak Q in a column, then flushed out by heating the column and collected in a cold trap. They were analysed directly by gas chromatography (GC) and GC-MS. The aroma concentrate obtained by (ii) simultaneous distillation-extraction with a Likens and Nickerson type apparatus was similarly analysed. By method (i) 78 compounds were seen on the chromatogram, 22 were positively identified, and 2 tentatively. Many C_8 -aliphatic oxygenated compounds were isolated, and because of their low threshold values and organoleptic properties these are thought to be the major contributors to matsutake headspace vapour. Method (ii) showed 127 compounds of which 27 were positively identified and 5 tentatively. Again oxygenated C_8 -aliphatics predominated, and means of their formation are discussed. LH

176

[Aroma characteristics of *Citrus iyo*.]

Yamanishi, T.; Fukawa, S.; Takei, Y.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 54 (1) 21-25 (1980) [9 ref. Ja, en] [Lab. of Food Chem., Ochanomizu Univ., Tokyo 112, Japan]

In order to find the aroma characteristics of *Citrus iyo*, the chemical compositions of the essential oil of *C. iyo* have been studied. The essential oil was prepared from fresh peel of the best quality of *C. iyo* by means of lyophilization. Since the oxygenated fraction had the typical aroma of *C. iyo*, analysis and characterization of the components were carried out on the carbonyl and non-carbonyl fractions. The quantities of main aroma components, i.e. 8 carbonyls and 14 non-carbonyl compounds, in the essential oil were determined. The compositional characteristics of the essential oil from *C. iyo* were found in predominant quantity of linalool and relatively large amounts of decanal, perillaldehyde, geranyl acetate and neryl acetate. However, the key substance which contributes to the aroma characteristics of *C. iyo* could not be identified, because of its very minor content. AS

177

[Methods for GLC analysis of aromas.]

Saura Calixto, F.; Berniejo, J.

Anales de Bromatología 31 (3/4) 379-390 (1979)

[22 ref. Es, en] [Facc. de Ciencias, Palma de Mallorca, Spain]

Conditions for GLC analysis of aromas are described in detail. Satisfactory results were obtained when this method was applied to cider apple volatiles. Analytical procedures and working conditions are discussed.

Retention numbers of many alcohols, esters and carbonyl compounds on Carbowax 1540 (70°, 90° and 126°C) and squalene (62°, 81°C) columns are tabulated. [From En summ.] RM

178

[Changes in flavour components of tomato fruits during artificial ripening.]

Chung, T.; Kurata, T.; Kato, H.; Fujimaki, M.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 53 (12) 391-400 (1979) [7 ref. Ja, en] [Dep. of Agric. Chem., Univ. of Tokyo, Yayoi, Bunkyo-ku, Tokyo 113, Japan]

Changes occurring in the volatile components during the ripening of field grown and artificially ripened tomato fruits were investigated. Fruits were ripened naturally or at 20°C under natural light or in the dark. Volatile components were collected both by steam distillation and headspace trapping using Porapak Q or cellulose powder, and analysed by gas chromatography (GC) and GC-MS. 79 components were identified from steam distillate, and 68 from headspace volatiles, comprising aldehydes, alcohols, phenols, ketones, esters, aromatic hydrocarbons, terpenes and others. When fruits were artificially ripened from the 'mature-green' stage to 'red' in the dark, the green tomato-like odour of the fruit was stronger than in field-ripened fruit of the same ripeness. Furthermore, the tomato juice-like odour of the dark-ripened fruit was stronger than that of field-ripened tomatoes. The volatile components in the steam distillate of field-grown tomatoes generally increased with ripening, particularly the middle and high boiling fractions. However, headspace volatiles showed complicated changes during ripening, particularly in the case of artificially ripened fruit. [From En summ.] JRR

179

The effect of blanching on enzyme activities and their relationship to the quality of frozen vegetables. I. Brussels sprouts.

Adams, J. B.

Technical Memorandum, Campden Food Preservation Research Association No. 242, 56pp. (1980) [4 ref. En]

Full details of the effect of blanch times and blanch temp. (0, 3, 6, 9, or 12 min at 160°, 180°, 200° or 208°F) both on the activity of a number of enzymes (peroxidase, catalase, lipase) in frozen Brussels sprouts and on the sensory properties of the cooked products are presented in graphical form. Similar details are given for each blanch treatment on the effect of storage time at -25°C (5-10 days, 1, 3, 6, 12 and 18 months). The correlations of the various enzyme activities with sensory attributes are shown in a correlation matrix. The detailed correlations between peroxidase activity and overall flavour at each assessment are used to obtain relationships between storage time and enzyme activity for 3 commercially acceptable flavour levels. The use of 'spot test values' of peroxidase activity for predicting flavour scores at various storage times is illustrated. AS

180

Some flavour components of Feta cheese.

Horwood, J. E.; Lloyd, G. T.; Stark, W.

Australian Journal of Dairy Technology 36 (1) 34-37 (1981) [25 ref. En] [Dairy Res. Lab., CSIRO Div. of Food Res., Highbett, Victoria 3190, Australia]

Samples of imported and Australian Feta cheeses were examined for composition of the fat and headspace volatiles and for free fatty acid content. The fat composition of Feta cheese imported from Bulgaria, Rumania and Greece was shown to resemble that of ewes' milk or a mixture of ewes' milk and cows' milk, whereas Australian Feta appeared to have been produced solely from cows' milk. The headspace volatiles of Bulgarian, Rumanian and Greek Feta cheese were qualitatively similar. They contained relatively large quantities of ethanol, propan-1-ol, butan-2-ol and butan-2-one as well as smaller amounts of pentane, propan-2-ol, ethyl acetate, 2-methylpropan-1-ol, toluene and ethyl butyrate. Free fatty acid analysis revealed that significant lipolysis had occurred in the Greek Feta cheese. Esterification of free butyric acid with ethanol had also occurred. Feta cheese from local sources exhibited profiles of headspace volatiles which were different from those of the Bulgarian, Rumanian and Greek Feta cheese. AS

181

Volatile compounds associated with spoilage of vacuum-packaged sliced luncheon meat by *Brochothrix thermosphacta*.

Stanley, G.; Shaw, K. J.; Egan, A. F.

Applied and Environmental Microbiology 41 (3) 816-818 (1981) [17 ref. En] [CSIRO Div. of Food Res., North Ryde, NSW, Australia]

By using gas chromatography-MS, 7 volatile compounds were identified in vacuum-packaged sliced corned beef spoiled by *Brochothrix thermosphacta* under aerobic conditions. Acetoin and diacetyl appeared to be of major sensory significance. AS

182

Effect of sulphur dioxide on the chemical composition and odour of mustard paste.

Frijters, J. E. R.; Griffiths, N. M.; Mather, A. M.; Reynolds, J.; Fenwick, G. R.

Chemical Senses 6 (1) 33-43 (1981) [14 ref. En] [Dep. of Human Nutr., Agric. Univ., De Dreijen 11, 6703 BC Wageningen, Netherlands]

Sulphur dioxide, added as a preservative to mustard paste, has been shown to react with allyl isothiocyanate to produce the adduct - allylaminothiocabonylsulphonate. This reaction changes the odour properties of the paste, causing a loss of mustard quality and the production of a garlic-like note. These changes have been investigated by the following psychophysical techniques: - odour detectability and characterisation, profile analysis and magnitude estimation. The relationships between the concn. of allyl isothiocyanate in the paste, in the headspace above the paste and its sensory intensity have also been studied. AS

183

Hydrolysis of *trans*-cinnamyl esters by the enteric bacterial cells (*Escherichia coli*).

Yano, K.; Takahashi, Y.

Laboratory Practice 30 (5) 468 (1981) [3 ref. En] [Dep. of Chem., Fukuoka Univ. of Education, Munakata-machi, Munakata-gun, Fukuoka 811-41, Japan]

Cassia oil has been generally used as a flavour for food, and *trans*-cinnamyl acetate is contained in cassia oil obtained from *Cinnamomum sieboldii*. This study examined whether cells of *E. coli* could hydrolyse *trans*-cinnamyl esters having different carbon chain lengths as a flavour. Cinnamyl formate, acetate, propionate, butyrate, valerate and caproate were synthesised in the usual manner, incubated with *E. coli* cells, and the cinnamyl alcohol in the extracts was identified gas chromatographically. Results showed that cinnamyl formate was considerably hydrolysed (19.7% hydrolysed cinnamyl) by the esterase of *E. coli* cells, but the other esters with 2-6 C atoms were not hydrolysed to any degree (0.3-1.5%). AL

184

Culinary & medicinal herbs - their continuing uses in food and medicine.

Anon.

British Food Journal 82 (896) 76-79 (1980) [En]

A large number of the herbs used for culinary and food processing purposes are considered; in most cases including some indication of the origin of the commercial product and the chemical compounds responsible for the flavour. JRR

185

Direct sampling method for gas chromatographic headspace analysis on glass capillary columns.

Green, J. D.

Journal of Chromatography 210 (1) 25-32 (1981) [25 ref. En] [Group Res. & Development Cent., British American Tobacco Co. Ltd., Regents Park Road, Southampton SO9 1PE, UK]

A method is described which allows a rapid, direct gas chromatographic headspace analysis to be made on capillary columns. The procedure incorporates a simple concentration stage, on a conventional packed pre-column, such that minor components present in headspace vapours can be detected. The method is illustrated by reference to tobacco and 3 freshly-picked herbs [rosemary, sage and mint]. AS

186

[Flavour of shoyu. I. Soy sauce.] [Review]

Yokotsuka, T.; Sasaki, M.; Nunomura, N.; Asao, Y. *Journal of the Society of Brewing, Japan [Nihon Jōkyōkai Zasshi]* 75 (6) 516-522 (1980) [65 ref. Ja] [Cen. Res. Inst., Kikkoman Co., Ltd., Noda, Japan]

187

Flavor additive.

British Soya Products Ltd.

UK Patent Application 2 046 076A (1980) [En]

Flavour additive derived from roasted soybeans is useful as a partial replacement for coffee, cocoa or caramel in food products. IFT

188

Evaluation of spices and oleoresins. IX. Correlation of pungency stimuli and pungency in ginger. Govindarajan, V. S.; Narasimhan, S.; Rajalakshmi, B.; Rajalakshmi, D.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 170 (3) 200-203 (1980) [11 ref. En, de] Cent. Food Tech. Res. Inst., Mysore-570013, India] Correlations between individual values determined for the (6)- and higher homologues of gingerol and shogaol by an improved TLC technique and pungency in Scoville units by the standardized procedure were studied for a number of ginger oleoresin samples representing varied processing and storage conditions. Earlier results of dominance of (6)-gingerol in fresh samples and both (6)-gingerol and (6)-shogaol in stored samples were confirmed. A multiple regression of both (6)-gingerol and (6)-shogaol on Scoville units of all samples was shown to be significant and a prediction equation was developed. Addition of higher homologues to the regression was insignificant in improving its efficiency. The correlation between predicted and determined values was highly significant. [See FSTA (1980) 12 7T365 for part VIII.] AS

189

[Model experiments on the Maillard reaction. III. Volatile products from the reaction of D-glucose with p-chloroaniline.] Modell-Untersuchungen zur Maillard-Reaktion. III. Flüchtige Reaktionsprodukte aus der Umsetzung von D-Glucose mit p-Chloranilin. Otto, R.; Baltes, W.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 171 (4) 286-291 (1980) [15 ref. De, en] [Inst. für Lebensmittelchem. der Tech. Univ. Berlin, Müller-Breslau-Strasse 10, D-1000 Berlin 12]

D-Glucose in 5X molar excess was reacted with p-chloroaniline for up to 150 h and the volatile products formed were studied by GLC-MS. Besides 5-hydroxymethylfurfural, 5-methylfurfural and furfural the following compounds were detected: hydroxymethylfurfural, the corresponding N-4'-chlorophenyl-pyrrole-aldehydes and the azomethines resulting from the furfurals and pyrrole aldehydes. Formation was shown of 3 quinolines and of 1 dihydroquinoline; these obviously were formed from carbonyl compounds originating from a decomposition of a primary Amadori-compound. During heating, an intermolecular redox reaction occurs at the furfuryl-group. [See FSTA (1979) 11 5A375 for part I.] AS

190

The heat stability of allyl glucosinolate (sinigrin) in aqueous and model systems.

Maheshwari, P. N.; Stanley, D. W.; Voort, F. R. van de; Gray, J. I.

Canadian Institute of Food Science and Technology Journal 13 (1) 28-32 (1980) [20 ref. En, fr] [Dep. of Food Sci., Univ. of Guelph, Guelph, Ontario N1G 2W1, Canada]

The thermal decomposition of allyl glucosinolate

(sinigrin), a major glucosinolate of *Brassica juncea*, by conventional and microwave heating was studied in aqueous and model systems. Decomposition of sinigrin by conventional heating in the aqueous system (phosphate buffer, pH 5.9, ionic strength, 0.2) was found to be a first order reaction with activation energy of 94.5 KJ/mol (22.6 Kcal/mol). Microwave irradiation of aqueous system samples for short periods of 0.5 min or more also resulted in decomposition of this glucosinolate. Decomposition of sinigrin by microwave heating in a model system formulated using soy and pure sinigrin monohydrate was found to be a function of the adjusted initial moisture level and the exposure period. Among the 7-20% moisture samples, min. decomposition occurred in 7% moisture samples which appeared to be due to relatively slow heating on exposure to microwave irradiation. More sinigrin was decomposed in the soya model system with increasing periods of microwave irradiation. Although a 3 min microwave exposure of soya model system samples resulted in scorching, it did not cause complete decomposition of sinigrin. AS

191

[New methods for evaluation and analysis of organoleptic qualities of foodstuffs and for prediction of their changes. XIV. Theory and determination of temperature dependence of the vapour pressure and the smell perception value of aroma substances (vanillin in an aqueous solution) by means of subjective olfactometry.] Neue Methoden der Be- und Auswertung sensorischer Eigenschaften von Lebensmitteln und der Berechnung ihrer Veränderungen. XIV. Zur Theorie und Bestimmung der Temperaturabhängigkeit des Dampfdruckes und der Geruchsintensität von Aromastoffen (Vanillin in wässrigen Lösungen) mit Hilfe der "Subjektiven Olfaktometrie".

Herrmann, J.; Abd-El-Salam, I.

Nahrung 25 (1) 11-24 (1981) [14 ref. De, en, ru] [Sektion Nahrungsgüterwirtschaft & Lebensmitteltech., Humboldt-Univ., Berlin]

A simplified mathematical model was used to derive a theory for calculating the effect of the reaction medium on vapour pressure and on the odour intensity, using 'subjective olfactometry'; vanillin was used as an example. Experimental results showed vapour pressure of vanillin to be dependent on temp., which was well illustrated by the August equation. Aroma intensity was directly proportional to vapour pressure and vanillin concn. A simple analytical technique was also developed for sensory detn. of evaporation enthalpy of aroma substances. [See FSTA (1981) 13 3A114 for part XIII.] IN

192

[Volatile nitrogenous compound formation during vodka manufacture.]

Sukhodol, V. F.; Kuts, A. M.; Bachurin, P. Ya;

Slavutskaya, N. I.

Fermentnaya i Spirtovaya Promyshlennost' No. 8, 25-28 (1980) [6 ref. Ru] [KTIPP, USSR]

Volatile N compounds pass into vodka from the original raw material, and consist of ammonia.

triethylamine, dimethylamine, diethylamine, propylamine and butylamine. They can be separated from vodka primarily by triethylamine separation using activated carbon. The rate of separation depends to a great extent on the quality of activated carbon and the filtration rate. The interrelation between the sensory properties of vodka and its content of volatile N compounds is discussed. STI

193

Importance of selected volatile components to natural orange, grapefruit, tangerine and mandarin flavors. [Lecture]

Shaw, P. E.; Wilson, C. W., III

ACS Symposium Series 143, 167-190 (1980) [46 ref. En][US Citrus & Subtropical Products Lab., USDA, PO Box 1909, Winter Haven, Florida 33880, USA]

Aspects reviewed are: components important to natural orange flavour, taste and aroma thresholds in water of individual orange juice components, effect of nonvolatile juice components on individual flavour thresholds, influence of selected volatile components on flavour of a bland orange juice drink, components important to natural grapefruit flavour and to mandarin flavour and aroma, and total aldehydes as a measure of oil quality. [See FSTA (1981) 13 11]1587.] AL

194

[Importance of aldehydes as flavour compounds and a HPLC apparatus built for their measurement.]

Bedeutung der Aldehyde als Flavour-Verbindungen und apparativer Aufbau eines HPLC-Messplatzes. [Review] Piendl, A.; Westner, H.; Geiger, E.

Brauwissenschaft 34 (3) 62-70 (1981) [166 ref. De, en, fr][Inst. für Brauereitech. & Mikrobiologie, Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

Aspects considered in this review include: the significance of aldehydes as flavour compounds; aldehydes and ketones present in beer; the importance of aldehydes in changes in the flavour of beer during ageing; and use of HPLC for analysis of aldehydes in beer. Basic principles of HPLC and the apparatus and reagents required are discussed. AJDW

195

The flavour components of plums: an examination of the aroma components present in the headspace above four cultivars of intact plums, Marjorie's Seedling, Merton Gem, NA 10 and Victoria.

Ismail, H. M. M.; Williams, A. A.; Tucknott, O. G.

Journal of the Science of Food and Agriculture 32 (5) 498-502 (1981) [5 ref. En][Long Ashton Res. Sta., Univ. of Bristol, Long Ashton, Bristol BS18 9AF, UK]

Qualitative and quantitative examination of the aromas above 4 cv. of intact plums, using gas chromatography (GC) and GC-MS, gave information on 33 components of which linalool, benzaldehyde,

methyl cinnamate and γ -decalactone were present in regions of the chromatogram associated with plum-like aromas. Comparison of the analytical data with the scoring of plum-like character by sensory means showed that the % concn. of these compounds only related approx. to the sensory scores, whereas the % of hexanol, the major component present in the extracts was inversely related. AS

196

The aroma of cranberries.

Hirvi, T.; Honkanen, E.; Pyysalo, T.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 172 (5) 365-367 (1981) [12 ref. En][Tech. Res. Cent. of Finland, Food Res. Lab., Biologinkuja 1, SF-02150 Espoo, Finland]

Comparative GLC-MS studies were conducted on volatile aroma compounds in (i) fresh European cranberries (*Vaccinium oxycoccus*) and in (ii) frozen American cranberries (*V. macrocarpon*). Tables of data are given. 70 components were identified, including 8 terpene hydrocarbons, 11 alcohols, 5 carbonyl compounds, 8 acids, 31 aromatic compounds and 4 lactones. Total volatiles content was 16.1 p.p.m. in (i) vs. 3.70 p.p.m. in (ii). Qualitative composition of volatiles in the 2 spp. were generally similar; concn. of individual compounds were generally 4-5 times higher in (i) than in (ii), concn. of 2-methylbutanoic acid in (i) (2.4 p.p.m.) was, however, much higher than in (ii) (0.01 p.p.m.). This compound is an important aroma constituent in cowberries. Many compounds were identified in (i) but not in (ii). Harvesting time and freezing had little effect on the aroma composition of (i). AJDW

197

Flavor quality of cultivated strawberries: the role of the sulfur compounds.

Dirinck, P. J.; Pooter, H. L. de; Willaert, G. A.; Schamp, N. M.

Journal of Agricultural and Food Chemistry 29 (2) 316-321 (1981) [17 ref. En][Dep. of Organic Chem., State Univ. of Gent, Coupure 533, B-9000 Gent, Belgium]

For detn. of the importance of the different aroma components for strawberry flavour at several times, different var. of strawberries were organoleptically evaluated for flavour intensity and quantitative GLC-MS analyses were performed. Interpretation of the results consisted of correlating the organoleptic data with the concn. of the flavour components, representatively isolated by headspace concn. on Tenax. In some comparisons significant sensory flavour intensity data could be related to the sum of the concn. of the volatiles, released when macerating the fruits. In other cases, especially with 'older' var. the difference in amount of S-containing compounds, which compared to the esters were present at a much lower concn., had to be taken into account. The methylthiol esters, methylthiol acetate and methylthiol butyrate, are reported for the first time in strawberries. AS

198

Methanol, ethanol, and acetaldehyde contents of citrus products.

Lund, E. D.; Kirkland, C. L.; Shaw, P. E.

Journal of Agricultural and Food Chemistry 29 (2) 361-366 (1981) [15 ref. En] [US Citrus and Subtropical Products Lab., USDA, Winter Haven, Florida 33880, USA]

The 3 major citrus volatiles methanol, ethanol, and acetaldehyde were quantitatively determined for various citrus products by gas chromatography [newly developed method described.] Methanol concn. varied from 10 to 80 p.p.m., ethanol from 90 to 900 p.p.m., and acetaldehyde from 50 to 190 p.p.m. (w/v). Correlations were examined between composition of volatiles and storage history or other quality factors. A positive correlation was observed between methanol content and storage time of canned grapefruit sections and between ethanol content and storage time of non-heat-treated, glass-packed grapefruit sections. Composite data for all single-strength juices (fresh and processed) showed that acetaldehyde concn. was higher and ethanol and methanol concn. were lower in grapefruit than in orange juice. Similarly, reconstituted commercial concentrates contained less methanol and ethanol and more acetaldehyde than single-strength juices. Similarity between the profiles of volatiles for some concentrates and the profile for single-strength juice suggested that these concentrates contained essence. Volatiles in single-strength juice did not correlate with Brix, acid pulp, or storage history, but a possible relationship between ethanol and the processing date for orange juice was found. Some of these correlations might be useful in quality evaluation. AS

199

Piperine and related compounds in pepper. I. Search for minor components.

Raghuveer, K. G.; Ananthakrishna, S. M.

Journal of Food Science and Technology, India 17 (6) 268-272 (1980) [11 ref. En] [Sensory Evaluation Discipline, Cent. Food Tech. Res. Inst., Mysore-570 013, India]

Solvent fractionation, crystallization of pepper oleoresin and pungency evaluation by threshold methods has indicated that mother liquor has compounds other than piperine. Further study with argentation-TLC showed the presence of a compound which has only a fourth of the pungency of piperine. The coloured compounds in a total extract of pepper contribute 3 to 5% to the absorption at 342 nm. It has also been shown that spectrophotometric method could be conveniently used on a single peppercorn. CFTR!

200

[Quantitative composition of natural and technologically modified plant aromas. IX. Freeze concentration of a dill herb extract.] Über die quantitative Zusammensetzung natürlicher und technologisch veränderter pflanzlicher Aromen. IX. Gefrierkonzentrierung eines Dillkraut-Extraktes. Schreier, P.; Drawert, F.; Heindze, I.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 172 (4) 257-263 (1981) [22 ref. De, en] [Inst. für Lebensmitteltech. & Analytische Chemie der TU München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

Effects of freeze concentration on the aroma substance composition of an acetic acid extract of dill herb are reported. Preliminary studies with water, 10 or 50% acetic acid, 10% ethanol and 1% ascorbic acid showed that 10% acetic acid was the most favourable extractant for aroma quality of the extract, suitability for freeze concentrating, and suitability for subsequent liquid-liquid extraction of aroma compounds. 1% ascorbic acid also performed well but was not further studied. Tabulated data show contents of 33 aroma compounds in dill herb, 10% acetic acid extract, in freeze concentrates at 4 different stages of concentration (extract content of 11-30%) and in the residual ice. Approx. 30% of dill aroma compounds were extracted into 10% acetic acid; no chemical changes of aroma compounds were observed during extraction. Yields of aroma compounds in the final freeze concentrate (extract content 30% w/w) varied with the nature of the compound. For the compounds thymol, myristicin, apiol, dillapiol and 3,9-epoxy-*p*-menth-1-ene (important for dill aroma) recoveries were 70-103% (from acetic acid extract). In general carbonyl compounds gave similar yields, but recoveries of terpene hydrocarbons were 6-11%, except for α -terpinene (55%). This low recovery was ascribed to acid catalysed reactions as a consequence of high acetic acid concn. produced. High yields of terpenols were obtained, e.g. carvotanacetol 115%, 4-terpinenol 131% and piperitol 115%. Average loss of aroma compounds into residual ice was 20%, but the ice was not washed. [See FSTA (1980) 12 4H642 for part VII.] DIH

201

Gas chromatography in food analysis.

Boniforti, L.; Lorusso, S.

Ernährung 5 (2) 68-73 (1981) [En] [Istituto Superiore di Sanita, 00161 Rome, Viale Regina Elena 299, Italy]

A review is given of applications of gas chromatography in various branches of the food industry, including the detn. of sugars, artificial sweeteners, and emulsifiers and stabilizers, e.g. sucrose diacetate hexaisobutyrate. References are available from the authors. MEC

202

Recent advances in the separation of volatile components. (In 'The analysis and control of less desirable flavours in foods and beverages' [see FSTA (1981) 13 12G820]) [Lecture]

Jennings, W.

pp. 3-16 (1980) [21 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, California, USA]

Methods for the separation of volatile flavour components are discussed, including 2-dimensional gas chromatography (GC), SECAT GC, and multiple-pass GC. AL

203

[The volatile fraction of grapes from Tierra de Barros (Badajoz).]

Mesa, J. L.; Maynar, J. L.; Mareca, I.
Revista de Agroquímica y Tecnología de Alimentos
21 (1) 114-120 (1981) [11 ref. Es, en] [Fac. de Ciencias,
Avenida Elvas, S/n, Badajoz, Spain]

Changes in qualitative and quantitative composition of the volatile fraction from Cayetana and Pardina grapes (Tierra de Barros, Badajoz, Spain) with the harvesting date (ripening, half-ripe, and at industrial maturity) were studied. The volatiles were isolated by solvent extraction and separation by MgSO_4 and acetone. Results showed a relative abundance of esters and negligible amounts of terpenes. During ripening a parallel rise was observed in aroma compounds and sugar contents, but their max. did not coincide. AS

204

Aroma composition of bottle aged white wine.
Simpson, R. F.

Vitis 18 (2) 148-154 (1979) [20 ref. En, de] [Australian
Wine Res. Inst., Glen Osmond, South Australia 5064,
Australia]

Effect of bottle ageing on aroma composition of white wine was studied by analysing commercial Riesling wines made by a standard winemaking procedure from grapes grown in the same district (of S. Australia) of 5 vintages from 1967 to 1977, wines being bottled in July-Oct. of yr of vintage. Headspace volatiles were analysed by gas chromatography in Dec. 1977; contents of 20 compounds are tabulated for each wine. The oldest wines had higher contents of furfural, linalool oxide (*trans* isomer), nerol oxide, vitispirane, ethyl furoate, 1,1,6-trimethyl-1,2-dihydronaphthalene (TDN) and dimethyl sulphide (DMS) than young wines, and had lower contents of isoamyl acetate, hexyl acetate and ethyl decanoate than did young wines. TDN and DMS accumulation was thought to be responsible for development of bottle age aroma; loss of grape aroma during ageing was attributed to oxidation of monoterpene alcohols such as linalool, geraniol and nerol. DIH

205

[3,7-Dimethyl-octa-1,5-dien-3,7-diol: a new terpenoid compound in grape and wine aroma.] 3,7-Dimethyl-okta-1,5-dien-3,7-diol - eine neue terpenoide Verbindung des Trauben- und Weinaromas.
Rapp, A.; Knipser, W.

Vitis 18 (3) 229-233 (1979) [6 ref. De, en]
[Bundesforschungsanstalt für Rebenzüchtung
Geilweilerhof, D-6741 Siebeldingen, Federal Republic of Germany]

Aroma compounds were extracted from grape juice and wine by Freon 11, and after concentration of the extract on a Vigreux column, it was analysed by glass capillary gas chromatography and the title compound was identified by GLC-MS. The compound was present in juice and wine from all *Vitis vinifera* grape var. examined; highest concn. were found in Scheurebe, Riesling und Forta. The compound was also present at low concn. in *V. labrusca* grapes and cv. Niagara, but was not detected in *V. riparia* grapes. DIH

206

Studies on the mechanism of aging of distilled liquors. VIII. Structure of a precursor of β -methyl- γ -octalactone, and aging flavor compound of distilled liquors.

Otsuka, K.; Sato, K.; Yamashita, T.

Journal of Fermentation Technology [Hakko Kagaku Zasshi] 58 (4) 395-398 (1980) [3 ref. En] [Nat. Res. Inst. of Brewing, Nat. Tax Administration, Takinogawa 2-6-30, Kita-ku, Tokyo 114, Japan]

The presence of a precursor of β -methyl- γ -octalactone, one of the important flavour components of distilled liquors, was confirmed in an extract of oak-wood powder. A component of the precursor obtained from the hydrolysate in baryta solution was identified as 3,4-dihydroxy-5-methoxybenzoic acid. From the results of gas chromatography and mass analysis the mol. wt. of the precursor was determined to be 340. The structure of the precursor was identified as 2-methyl-3-(3,4-dihydroxy-5-methoxybenzo)-octanoic acid. AS

207

The gas chromatographic-mass spectrometric examination of the volatiles produced by the fermentation of a sucrose solution.

Williams, A. A.; Hollands, T. A.; Tucknott, O. G.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 172 (5) 377-381 (1981) [16 ref. En, de] [Univ. of Bristol, Long Ashton Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

Studies were conducted on volatiles formed during fermentation of a model solution (containing sucrose as the C source, and other nutrients at the min. level compatible with yeast growth) by *Saccharomyces cerevisiae* AWY 350 R at 25°C for 3 wk. Volatiles were isolated from the fermented liquor by vacuum-stripping; the volatiles concentrate was then purified, dried, and analysed by GLC-MS. Tables of data are given showing the volatiles identified 8 alcohols, 6 carbonyl compounds, 9 acetals and 25 esters were identified in the neutral fraction; 17 acids were identified in the acidic volatiles fraction. Of the compounds identified, 45 were recorded for the first time in a sucrose fermentation. No S compounds were detected, despite the 'sulphury' odour of the fermented liquor. Volatiles formed in this sucrose fermentation were compared with literature data for volatiles in cider. AJDW

208

Analytical control of sulfur compounds in beer. A review. [Review]

Garza-Ulloa, H.

Brewers' Digest 55 (1) 20-24, 26 (1980) [95 ref. En]

[Cerveceria Cuahatemoc SA, Monterrey, N. L., Mexico]

The volatile S compounds most frequently reported in beer are H_2S , SO_2 , dimethyl sulphide, methyl mercaptan, ethyl mercaptan and, infrequently, dimethyl sulphide. Gas chromatography is the method that provides the most complete and selective information. The use of gas chromatography as separation technique, headspace as sampling method and flame photometry as the detection system, allows the sensitive and specific detn. of each one of the volatile S compounds present in a sample, as long as they appear

a concn. above the sensitivity limit of this method (2 µg of SH/L). If a gas chromatograph is not available, the S compounds mentioned above, except for methyl and ethyl mercaptan, can be determined selectively with fluorometric and colorimetric methods which have desirable characteristics such as good sensitivity, no artifact formation and good reproducibility. AS

209

The flavour of plums (*Prunus domestica* L.). An examination of the aroma components of plum juice from the cultivar Victoria.

Smial, H. M.; Williams, A. A.; Tucknott, O. G. *Journal of the Science of Food and Agriculture* 32 (6) 613-619 (1981) [21 ref. En] [Long Ashton Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

Vacuum steam distillation followed by solvent extraction, chemical separation and examination of the final extract by GLC and GLC-MS, enabled 73 volatile components to be identified in juices prepared from plums of the cv. Victoria. Of these, odour evaluation of the gas chromatographic exit as the components were being separated, indicated that benzaldehyde, linalool, ethyl nonanoate, methyl cinnamate and γ -decalactone contribute to 'plum' aroma. Milling the plums, as opposed to merely removing the stones prior to enzyming and expressing the juice, increased the concn. of hexanol and *cis* 3-hexenol and also produced hexanal and *trans* 2-hexenal, these 4 components giving rise to the characteristic 'green' aroma of juice prepared in this way. AS

210

Separation and processing effects on aromatic components of saskatoon berries (*Amelanchier alnifolia* Nutt.).

Mazza, G. *HortScience* 15 (6) 754-755 (1980) [7 ref. En] [Alberta Hort. Res. Cent., Brooks, Alberta, Canada T0J 0J0]

Aroma essences of reproducible composition were separated from saskatoon berries by concentration of the headspace. Gas chromatography revealed 12 components in the aroma essences. The quantitative composition of the essences differed significantly among fresh berries, juice and jelly, and among fruit from 2 locations. AS

211

Studies on mango flavor.

Abd-El-Baki, M. M.; Askar, A.; El-Samahy, S. K.; Abd-El-Fadeel, M. G.

Deutsche Lebensmittel-Rundschau 77 (4) 139-142 (1981) [22 ref. En, de, fr] [Dep. of Food Sci., Univ. of Zagazig, Zagazig, Egypt]

Studies on 3 mango var., (i) Zebda, (ii) Pairy and (iii) Balady are described. Aroma compounds were isolated by vacuum distillation and analysed by GLC. Chromatograms of results are given. Major aroma volatiles were camphene, myrcene, limonene, ocimene, linalool, citronellol and α -terpineol. Mean values for concn. of various classes of flavour compounds in mangoes were, for (i), (ii) and (iii) resp.: esters 116, 99 and 125; carbonyl compounds 32, 20 and 26; oxygenated terpenes 49, 38 and 44; and limonene 31, 25 and 36.

These results are considered in relation to the organoleptic properties of the 3 var. Data are also presented for the proximate composition, wt, size, sp. gr. and % peel, % stone and % edible tissue for (i), (ii) and (iii). AJDW

212

Thiazoles, oxazoles and oxazolines identified in the volatile flavor of roasted peanuts.

Lee, M. H.; Ho, C. T.; Chang, S. S.

Journal of Agricultural and Food Chemistry 29 (3) 684-686 (1981) [28 ref. En] [Dep. of Food Sci., Rutgers, State Univ. of New Jersey, New Brunswick, New Jersey 08903, USA]

Volatile flavour compounds were isolated from 70 kg of roasted peanuts by a specially designed apparatus. The isolated volatile flavour compounds were subjected to extensive gas chromatographic fractionation, and the pure fractions obtained were identified by IR and MS. 8 thiazoles, 7 oxazoles, and 3 oxazolines were identified. All of them, except 4-methylthiazole, were new to the roasted peanut flavour. AS

213

[Enzymic production of flavour of milk products. I. Nature of the flavours and their origin.] [Review]

Iwai, M.

Kagaku to Kogyo (Osaka) 52 (2) 48-55 (1978) [12 ref. Ja] [Osaka Municipal Ind. Res. Inst., Osaka, Japan]

Chemical substances responsible for flavours within skim, dried and conc. milk, butter and cheese are tabulated and classified according to possible origin. Reactions that take place in milk during storing, heating or processing and which lead to the formation in particular of aldehydes and ketones are outlined. Enzymes involved in flavour reactions are also listed.

BWH

214

[Enzymic production of flavour of milk products. II. Production by lipase.] [Review]

Iwai, M.

Kagaku to Kogyo (Osaka) 52 (3) 93-99 (1978) [11 ref. Ja] [Osaka Municipal Ind. Res. Inst., Osaka, Japan]

Factors affecting enzymic fat hydrolysis and the development of butter flavour in milk are discussed. The effects of lipase from various organisms including *Aspergillus niger*, *Rhizopus delemar*, *Penicillium cyclopium* and yeasts and pancreatic lipase are compared. BWH

215

Flavor volatiles formed by heated milk. (In *The analysis and control of less desirable flavors in foods and beverages* [see FSTA (1981) 13 12G820]) [Lecture]

Shibamoto, T.; Mihara, S.; Nishimura, O.; Kamiya, Y.; Aitoku, A.; Hayashi, J.

pp. 241-265 (1980) [43 ref. En] [Dep. of Environmental Toxicology, Univ. of California, Davis, California 95616, USA]

Volatile compounds, extracted with dichloromethane from the steam distillates of raw and heated milks, were identified by GLC/MS analysis. 45 compounds were

positively identified and 16 were tentatively identified. Compounds identified included acids, alcohols, esters, ketones, lactones, furans, pyrazines, pyrroles and thiophenes. Flavour threshold values for 28 compounds found in raw and heated milk are given. Furans and certain alcohols were found to be important contributors to the off-flavour of heated milk. MEG

216

Analysis of autoxidized fats by gas chromatography-mass spectrometry. VII. Volatile thermal decomposition products of pure hydroperoxides from autoxidized and photosensitized oxidized methyl oleate, linoleate and linolenate.

Frankel, E. N.; Neff, W. E.; Selke, E.

Lipids 16 (5) 279-285 (1981) [35 ref. En] [N. Reg. Res. Cent., USDA, Peoria, Illinois 61604, USA]

To clarify the sources of undesirable flavours, pure hydroperoxides from autoxidized and photosensitized oxidized fatty esters were thermally decomposed in the injector part of a gas chromatograph-MS system. Major volatile products were identified from the hydroperoxides of methyl oleate, linoleate and linolenate. Although the hydroperoxides from autoxidized esters are isomerically different in position and concn. than those from photosensitized oxidized esters, the same major volatile products were formed but in different relative amounts. Distinguishing volatiles were, however, produced from each type of hydroperoxide. The 9- and 10-hydroperoxides of photosensitized oxidized methyl oleate were thermally isomerized in the injector port into a mixture of 8-, 9-, 10- and 11-hydroperoxides similar to that of autoxidized methyl oleate. Under the same conditions, the hydroperoxides from autoxidized linoleate and linolenate did not undergo significant interconversion with those from the corresponding photosensitized oxidized esters. The compositions of the major volatile decomposition products are explained by the classical scheme involving carbon-carbon scission on either side of alkoxy radical intermediates. Secondary reactions of hydroperoxides are also postulated, and the hydroperoxy cyclic peroxides from methyl linoleate (photosensitized oxidized) and methyl linolenate (both autoxidized and photosensitized oxidized) are suggested as important precursors of volatiles. [See FSTA (1981) 13 (4) N222 for part VI.] AS

217

Synthesis and assessment of three compounds suspected as egg aroma volatiles.

Gil, V.; MacLeod, A. J.

Journal of Agricultural and Food Chemistry 29 (3) 484-488 (1981) [22 ref. En] [Dep. of Chem., Queen Elizabeth Coll., London Univ., London W8 7AH, UK]

Previous work provided evidence of the occurrence of 3 novel compounds in the aroma volatiles of hen's egg, namely, 1,2,4-trithiolane, 2-butylindan, and *O*-decylhydroxylamine. Here the synthesis of these 3 compounds is reported, but only the first 2 were confirmed as genuine components of egg volatiles. This is the first report of 1,2,4-trithiolane as a food volatile. AS

218

Gas chromatographic and mass spectrometric studies of ginger constituents. Identification of gingerdiones and new hexahydrocurcumin analogues.

Harvey, D. J.

Journal of Chromatography 212 (1) 75-84 (1981) [19 ref. En] [Univ. Dep. of Pharmacology, South Parks Road, Oxford OX1 3QT, UK]

The pungent principles of ginger (*Zingiber officinale* Roscoe), the gingerols and related compounds, were investigated by gas chromatography (GC) and GC/MS using several chemical derivatives and deuterium labelling. Gingerdiones, postulated intermediates in the biosynthesis of the gingerols, were identified together with desmethylhexahydrocurcumin and the shogaol analogues of the hexahydrocurcumins. AS

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4

TECHNIQUES FOR ANALYSIS OF FLAVOUR VOLATILES

SELECTED FROM VOLUME **14**
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under the direction of:-

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H. BROOKES

EDITOR

1

Formation of volatile compounds in sugar-phenylalanine and ascorbic acid-phenylalanine model systems during heat treatment. Seck, S.; Crouzet, J.

Journal of Food Science 46 (3) 790-793 (1981) [30 ref. En] [Cent. de Genie & Tech. Alimentaires, Lab. de Biochimie Appliquee-USTL, Place E. Bataillon 34060, Montpellier Cedex, France]

Formation of volatile compounds during heating at 99°C for 1.8 min of model systems composed of dil. solutions of sugars (glucose or fructose) or ascorbic acid with phenylalanine was investigated. The results obtained show that furfural is the only furan derivative formed under these conditions and quantitative data indicate that ascorbic acid is its main precursor. The other derivatives found in tomato juice heated under the same conditions (5-methyl furfural, 2-acetylfuran, 5-methyl-2-acetylfuran, furfuryl alcohol) are not formed. The formation of phenylacetaldehyde can be explained by Strecker degradation of phenylalanine rather than direct thermolysis of this product. Aromatic hydrocarbons, found in the 3 model systems studied, are certainly formed by thermal degradation of phenylalanine. IFT

2

Analysis of essential oil and perfume samples by a glass capillary coated with Pluronic F68 stationary phase.

Gazdag, M.; Szepesi, G.; Mihalyi, K.; Vigh, G.; Hlavay, J. *Chromatographia* 14 (5) 296-302 (1981) [9 ref. En] [Gedeon Richter Ltd., PO Box 27, H-1475 Budapest, Hungary]

A high performance Pluronic F68 glass capillary column was used successfully for the analysis of various samples of essential oils, perfumes, aroma concentrates (apple, cherry, nutmeg, orange, raspberry) and for routine quality control of incoming essential oil batches. No deterioration in the separation characteristics of the column was observed over an 18-month period during which the column was temp. programmed up to 240°C. AS

3

[Application of the mass spectrometer in food analysis. Selected examples.] Einsatz des Massenspektrometers in der Lebensmittelanalyse - ausgewählte Beispiele.

Eberhardt, R.; Woidich, H.; Pfannhauser, W. *Ernährung* 4 (4) 149-151 (1980) [3 ref. De, en] [Forschungsinst. für Ernährungswirtschaft, Blasstrasse 29, 1190 Vienna, Austria]

Basic principles of MS, GLC-MS and mass-fragmentography are briefly discussed. Applications considered include: analysis of headspace gases in packs, etc.; identification of aroma compounds, e.g. in fruit brandies; detection of artificial flavouring agents in raspberry juice; and analysis for pesticide residues. Equipment required is briefly considered, and mass fragmentograms are illustrated. AJDW

4

Volatile constituents from Concord, Niagara (*Vitis labrusca*, L.) and Elvira (*V. labrusca*, L. × *V. riparia*, M.) grapes.

Schreier, P.; Paroschy, J. H.

Canadian Institute of Food Science and Technology Journal 14 (2) 112-118 (1981) [28 ref. En, fr] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

By means of combined vacuum distillation and extraction, volatile constituents were separated from the berries of Concord, Niagara (*V. labrusca*, L.) and Elvira (*V. labrusca*, L. × *V. riparia* M.) grapevines. Using the combination of adsorption chromatography on silica gel and coupled gas chromatography (GC)-MS, 25 acids, 19 alcohols, 22 carbonyls, 63 esters, 6 hydrocarbons and 10 compounds of miscellaneous structures were identified. Numerically prevailing were unsaturated esters such as ethyl *trans*-2-hexenoate, ethyl *trans*-2-octenoate, ethyl *cis*-4-decenoate, ethyl *trans*-2-decenoate, and especially the isomer ethyl 2,4-decadienoates were found to contribute to the inherent sweet-fruity odour of the 2 *labrusca* cv. investigated. 2,5-dimethyl-4-methoxy-3(2H)-furanone (DMF) may be responsible for the caramel-like undertone in the aroma fraction obtained from Concord and Niagara grapes. Despite the preparative GC enrichment of this fraction, the structure(s) of the substance(s), which might be responsible for this undesirable sensory impression, could not be determined. The composition of volatile substances in the cultivars studied differed only quantitatively and not qualitatively. Quantitative GC showed the level of volatile compounds in Elvira grapes to be lower than the 2 *labrusca* cv. Methyl anthranilate, methyl and ethyl 3-hydroxybutanoate, ethyl 2-butenate and DMF, were all detected in high amounts in Concord and Niagara grapes, but were only found in trace amounts in Elvira grapes. AS

5

Volatile components of *Artemisia Vallesiaca* All. (Mountain wormwood).

Frattini, C.; Nano, G. M.; Bicchi, C.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 172 (6) 457-459 (1981) [6 ref. En, de] [Istituto Chimica Farmaceutica e Tossicologica, Corso Raffaello 31, I-10125 Turin, Italy]

Leaves and flowers of *A. vallesiaca* are widely used in production of vermouths and liqueurs, but as chemical composition of essential oil of the plant was almost unknown, this was studied. 1 kg of leaves and flowers was steam-distilled to yield 5.1 g essential oil. Gas chromatographic analysis of total oil, using wall coated open tubular columns (WCOT, coated with Carbowax 20M), revealed > 100 components, many in minor amounts. These were studied further by silica gel chromatography of total oil, eluting 1st with light petroleum (b.p. 40-60°C) and then with a gradient of increasing concn. of dichloromethane in light petroleum. Each fraction was then analysed by WCOT gas chromatography. Principal components of the oil (67-68% in total) were camphene, 1,8-cineole, camphor and borneol, 52 compounds were positively identified and are tabulated. DIH

6

Importance of nootkatone to the aroma of grapefruit oil and the flavor of grapefruit juice.

Shaw, P. E.; Wilson, C. W., III

Journal of Agricultural and Food Chemistry 29 (3) 677-679 (1981) [12 ref. En] [US Citrus & Subtropical Products Lab., USDA, Winter Haven, Florida 33880, USA]

The influence of nootkatone on the aroma of cold-pressed grapefruit oil and the flavour of grapefruit juice flavoured with either the oil, limonene, or nootkatone in limonene was studied. Nootkatone had more effect on the aroma of the oil than on the flavour of juice flavoured with the same oil. The aroma of oil with a naturally high nootkatone level was usually distinguishable from that of other samples. The frozen concentrated juice used in this study contained nootkatone (at approx. 7 p.p.m. after reconstitution to single-strength juice) at slightly above its threshold level prior to addition of oil despite its apparent low oil content. The aroma and taste panel results suggest that several other components of grapefruit oil are essential to good grapefruit aroma and flavour in addition to nootkatone. AS

7

Volatile halogenated compounds (VOHal) in drinking waters of the Federal Republic of Germany. [Lecture]

Gabel, B.; Lahl, U.; Bätjer, K.; Cetinkaya, M.; Düszel, J. von; Kozicki, R.; Podbielski, A.; Stachel, B.; Thiemann, W.

Science of the Total Environment 18, 363-366 (1981) [11 ref. En] [Trinkwassergruppe, Projekt Weserwasser, Univ. Bremen, Postfach 330440, D-2800 Bremen 33, Federal Republic of Germany]

Volatile halogenated hydrocarbons (VHH) in drinking water were extracted by a stripping procedure with liquid-liquid extraction, and measured by gas chromatography (GC) using an electron capture detector and GC-MS-capillary identification. Of 18 cities on the Rhine, Main, Ruhr and Weser rivers VHH levels in tap water were 2-56 µg/l (mean 21.3), trichloromethane levels were 0.1-34 µg/l (mean 4.3), tribromomethane levels were 0.3-14 µg/l (mean 4.3), and Cl⁻ levels were 28-340 mg/l (mean 120); corresponding values for 50 cities in the Federal Republic of Germany were 0.1-56 (11.9), 0.1-34 (2.7), 0.1-14 (2.7), 7-340 (76); 100 other German cities showed values of 0.1-64 (5.2), 0.1-40 (1.3), - (0.2), and -; 80 American cities showed values of 3.9-628 (28.2), 0.1-311 (21.0), 0.8-92 (0.1), and -. [See FSTA (1982) 14 1H5.] LH

8

Preparation and analysis of liquid CO₂ hop extracts.

Bodkin, C. L.; Clarke, B. J.; Kavanagh, T. E.; Moulder, P. M.; Reitze, J. D.; Skinner, R. N.

Journal of the American Society of Brewing Chemists 38 (4) 137-142 (1980) [8 ref. En] [Carlton & United Breweries Ltd., Melbourne 3001, Australia]

Hop extracts were prepared from several hop var. grown in Europe, America and Australia, using liquid CO₂ as the extracting solvent. Significantly less of the soft resin fraction was extracted by liquid CO₂ than by

either n-hexane or methylene chloride. However, approx. 95% of the α-acids and 95-100% of the β-acids were extracted by liquid CO₂ in all cases. The composition of the essential oil fractions isolated by vacuum steam distillation of the extract and the hops from which the extract was derived were found to be very similar. None of the hard resin fraction was extracted by liquid CO₂. Selected liquid CO₂ extracts were compared analytically with commercial solvent extracts prepared from the same hop var. AS

9

[Influence of fermentation temp. on composition of dry white wine.]

Bisson, J.; Daulny, B.; Bertrand, A.

Connaissance de la Vigne et du Vin 14 (3) 195-202 (1980) [11 ref. Fr, en, de, es, it] [Domaine d'Experimentation Viticole INRA, 58200 Cosne Cours sur Loire, France]

In research aimed at establishing the optimum temp. for vinification, sulphited (5 g/hl) must of Sauvignon var grapes was filtered after 12 h sedimentation. 0.75 l fully fermented wine was added to each of 3 × 25 l samples of clear must (sugar content, 208 g/l; acidity (as H₂SO₄), 6 g/l), which was subsequently kept at (i) 7°C, (ii) 13°C or (iii) 30°C. Fermentation of (i) and (ii) proceeded normally, but stopped in (iii) after 10 days, when the must had to be reinoculated with 25 g/l dried yeast (*Saccharomyces cerevisiae*). At the end of fermentation the wines were sulphited (75 mg/l) and stored at 7°C until bottling, after which standard analyses were carried out (no significant differences were observed between samples), and volatile substances were determined by gas chromatography. Contents of fatty acid ethyl esters were highest in (ii), the sample showing the best balanced aroma. A taste panel adjudged wine (iii) unsatisfactory, (i) satisfactory and (ii) best of the three. It is noteworthy that the natural fermentation temp. of Sauvignon wines in Central France is generally low; hence, for best results 12-15°C is recommended. KME

10

[Influence of maturity of grapes at harvest on content of volatile substances in wines.]

Bertrand, A.

Connaissance de la Vigne et du Vin 14 (3) 203-205 (1980) [Fr] [Inst. d'Oenologie, Univ. de Bordeaux II, 351 Cours de la Liberation, 33405 Talence Cedex, France]

Use of fungicides to combat *Botrytis cinerea* has meant that later harvesting of grapes is possible. In a preliminary study to ascertain whether this delay is justified, 8 samples of Semillon grapes were picked in the same Bordeaux vineyard in 1979, 3 between 1 and 8 Oct., 2 between 15 and 20 Oct., and 3 between 2 and 6 Nov.; they were then pressed and fermented in identical manner, using dried yeasts (*Saccharomyces cerevisiae*, 10 g/hl). The resultant wines were analysed and tasted in Jan. 1980. pH increased (3.06 to 3.13) and titratable acidity decreased (4.38 to 3.56 g H₂SO₄/l) with increased lateness of harvesting. Similarly, glycerol decreased (5.47 to 4.77 g/l) and the decline in higher alcohols and volatile short-chain fatty acids (both of

which affect wine quality adversely) was statistically significant at $\geq 95\%$ level of confidence. A taste panel judged that the wines improved progressively in relation to lateness of grape harvesting. KME

11

[Aroma composition of fruit wines. 1. Strawberry wine.] Über die Aromastoffzusammensetzung von Fruchtweinen. I. Erdbeerwein. Schreier, P.; Drawert, F. *Chemie Mikrobiologie Technologie der Lebensmittel* 7 (1) 23-27 (1981) [42 ref. De, en] [Inst. für Lebensmitteltech. & Analytische Chem. der Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

The aroma compounds of 2 strawberry wines (made using Senga Sengana strawberries from 2 different harvesting times) prepared by the authors, were studied. Aroma compounds were separated by liquid-liquid extraction and determined by column chromatography on silica gel, GLC and GLC/MS (results tabulated). Conc'n. of fruit-derived aroma compounds, e.g. 2,5-dimethyl-4-methoxy-3(2H)-furanone, methyl cinnamate and γ -decalactone in authentic wines could be used to detect adulteration of wines with aroma compounds. RAW

12

Heterocyclic flavour volatiles formed in the basic fraction of roasted *Phaseolus aureus* (Mung Dal). Vasundhara, T. S.; Parihar, D. B. *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 172 (6) 460-465 (1981) [16 ref. En] [Defence Food Res. Lab., Mysore 10, India]

Roasted Mung dal is consumed in a variety of sweet and savoury dishes in India, but few studies have been made on nature of volatiles present in roasted Mung dal. Basic heterocyclic compounds were studied in roasted (120°C for 2 h) split dehusked *P. aureus*, and in samples that had received an alkali treatment (5% NaHCO₃ solution for 3 h) before drying and roasting. Extracts from roasted powdered samples were studied by TLC and GLC. 11 basic heterocyclic compounds were identified, 10 in alkali-treated roasted pulse (SA) and 7 in untreated roasted pulse (SB). Quantities of compounds found (mg/20 kg) were as follows: found in SA only - 2-methylpyridine 4.2; 2,3,5-trimethylpyrazine 15.1; 2,3,5,6-tetramethylpyrazine 11.3; pyrazine 5.2; in SB only 4-methyl-5(β -hydroxyethyl)thiazole 38.2; in SA and SB, resp. - 2-methylpyrazine 3.6, 5.2; 2-ethylpyrazine 17.4, 6.1; 2-ethyl-5-methylpyrazine 3.7, 3.6; 3-methoxy-3-isobutylpyrazine 3.5, 3.1; 2-methylthio-3-ethylpyrazine 4.1, 5.2; 2-ethoxy-3-isopropylpyrazine 6.4, 3.9. Roasting after alkali treatment is said to improve flavour; significance of difference in composition for flavour differences is discussed. DIH

13

Importance of thymol, methyl *N*-methylantranilate, and monoterpene hydrocarbons to the aroma and flavor of mandarin cold-pressed oils.

Wilson, C. W., III; Shaw, P. E.

Journal of Agricultural and Food Chemistry 29 (3) 494-496 (1981) [10 ref. En] [US Citrus & Subtropical Products Lab., USDA, Winter Haven, Florida 33880, USA]

Various combinations of thymol, methyl *N*-methylantranilate (DMA), γ -terpinene, and β -pinene were added to tangerine cold-pressed oil at levels found in Argentine (Sicilian) mandarin oil. The aromas of the compounded oils and Argentine mandarin oil were compared, and then the flavours of tangerine juice containing the compounded oils and mandarin oil were compared. The presence of both β -pinene and γ -terpinene in addition to thymol and DMA was necessary to give the tangerine oil an acceptable mandarin aroma. However, additional citrus components were necessary to give the tangerine oil an acceptable mandarin flavour in tangerine juice. Flavour thresholds were determined for DMA in water and for thymol and DMA in single-strength tangerine juice. AS

14

The presence of damascenone in cultivars of *Vitis vinifera* (Linneaus), *rotundifolia* (Michaux), and *labruscana* (Baily).

Acree, T. E.; Braell, P.; Butts, R. M.

Journal of Agricultural and Food Chemistry 29 (3) 688-690 (1981) [13 ref. En] [Cornell Univ., New York Agric. Exp. Sta., Geneva, New York 14456, USA]

As part of a study of the compounds responsible for the sweet perfumy aroma of grapes of spp. *V. labruscana* and *rotundifolia* which is stronger than aroma of most *vinifera* cv., grape juice and wines from several cv. were analysed for presence of damascenone. Juice and wine were extracted with Freon 113, and Freon extracts were fractionated by Florisil column chromatography, eluting with 0, 1, 3, 10 and 30% diethyl ether in pentane. 90% of the damascenone eluted in the 3% ether fraction. Florisil fractions were then analysed by capillary gas chromatography/MS. A total of 11 cv. of the 3 grape spp. was examined; damascenone was present in all of them at concn. greater than the odour threshold in water. Highest concn. in juice (4.92 ng/g) was found in Concord cv. of *V. labruscana*. Range of concn. (ng/g) found in juices and wines was *V. labruscana* 0.17-4.92, *V. rotundifolia* 0.14-0.38 and *V. vinifera* 0.13-0.85. DIH

15

Coumarins and psoralens in grapefruit peel oil.

Tatum, J. H.; Berry, R. E.

Phytochemistry 18 (3) 500-502 (1979) [12 ref. En] [US Citrus & Subtropical Products Lab., Winter Haven, Florida 33880, USA]

4 coumarins, 4 psoralens and 2 methoxyflavones were isolated and identified from the peel oil of grapefruit. 5 of these compounds are reported as constituents of grapefruit oil for the first time, one of which, 5[(3,7-dimethyl-6-epoxy-2-octenyl)oxy]psoralen is a new natural product. AS

16

Volatile flavor components of soursop (*Annona muricata*).

MacLeod, A. J.; Pieris, N. M.

Journal of Agricultural and Food Chemistry 29 (3) 488-490 (1981) [7 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Univ. of London, Campden Hill Road, London W8 7AH, UK]

Representative samples of the aroma volatiles of soursop – a tropical fruit – were obtained by means of a modified Likens & Nickerson apparatus by using 2-methylbutane as the solvent. Extracts were concentrated by a low-temp. – high-vacuum distillation procedure, and components of resultant essences were identified as far as possible by GLC-MS, using both electron impact and chemical ionization MS. Most aroma components were esters (approx. 80% of the sample), and they constituted a chemically closely related series. Methyl hexanoate (approx. 31%) and methyl hex-2-enoate (approx. 27%) were the two most abundant components and together amounted to approx. 0.7 mg/kg of fruit. [See FSTA (1982) 14 1A4.] AS

17

[Variations in content of aroma-forming compounds, crust thickness and baking losses as a function of loaf weight.]

Markianova, L. M.; Roiter, L. M.

Pishchevaya Promyshlennost', Respublikanskii Mezhdvedomstvennyi Nauchno-tekhnicheskii Sbornik No. 26, 68-70 (1980) [3 ref. Ru]

Kinetics of aroma formation were studied in Ukrainian bread (liquid sponge), which is made from grade II wheat and rye flour (40:60). The loaves are round, weighing 0.5, 0.8, 1.0, 1.25, 1.5 and 2.0 kg, baked at 230°C, for 32, 36, 39, 42, 46 and 52 min. Volatile aroma substances and SS compounds were determined 30 min after baking in crumb and crust; thickness of upper and lower crust was also determined. Carbonyl compounds were analysed chromatographically; the same carbonyl compounds were found in all bread samples (13 aliphatic, 3 aromatic and 1 heterocyclic), but at different levels in different loaf sizes. Volatile compound content increased in crumb from 0.5 to 2.0 kg loaves by 20%; increase in crust was 40%. SS compounds increased with increasing bread wt. only slightly in crumb, but very markedly in crust. Thickness of upper crust rose by 60%, and that of the lower crust by 63%, with increasing bread wt. (from 0.5 to 2.0 kg). The proportion of crust was 5.1% lower in 2-kg loaves than in 0.5 kg loaves. Baking loss decreased by a mean 2.5% with increasing loaf wt. Heavier loaves had more pronounced aroma and were higher in nutrients. STI

18

Quality evaluation of raw tuna by gas chromatography and sensory methods.

Human, J.; Khayat, A.

Journal of Food Science 46 (3) 868-873, 879 (1981) [35 ref. En] [Van Camp Sea Food Co., Res. Cent., 4245 Sorrento Valley Boulevard, San Diego, California 92121, USA]

5 components of the volatile profile of tuna, obtained by GLC, showed a significant correlation to the raw tuna quality evaluated organoleptically. A chemical quality index (Q.I.) was developed on commercially available tuna using the concn. of 5 components: ethanol, propanol, butanol, hexanal, and 1-pentene-3-ol. Quality designation of raw tuna using the Q.I. index resulted in a more accurate classification than the organoleptic method. IFT

19

Analysis of fish and sediment for volatile priority pollutants.

Hiatt, M. H.

Analytical Chemistry 53 (9) 1541-1543 (1981) [8 ref. En] [US Environmental Protection Agency, Environmental Monitoring Systems Lab., PO Box 15027, Las Vegas, Nevada 89114, USA]

Volatile organic compounds are vaporized from the fish or sediment matrix under vacuum and condensed in a purging trap cooled by liquid N₂. The purging trap is transferred to a conventional purge and trap device where the concentrate is treated as a water sample and analysed by the EPA (Environmental Protection Agency)-recommended method 624. This vacuum extraction method gave average recovery of volatile priority pollutants of 74% from fish matrices spiked with 25 µg/kg, which is a considerable improvement over reported results for existing procedures; the method has immediate application to environmental analysis. AL

20

Gas chromatographic-mass spectrometric determination of volatile organic compounds in fish

Easley, D. M.; Kleopfer, R. D.; Carasea, A. M.

Journal of the Association of Official Analytical Chemists 64 (3) 653-656 (1981) [10 ref. En] [Environmental Protection Agency, Region VII Lab., 25 Funston Road, Kansas City, Kansas 66115, USA]

The methodology is based on procedures used to determine purgeable organic compounds in water and wastewater. Fish tissue is added to reagent water, cooled in an ice bath, and homogenized with cell disruption using ultrasonic energy. The processed sample is then analysed by a purge and trap procedure using an impinger-type device at 70°C, with detn. of the purged compounds by computerized gas chromatography-MS. Both ground fish and cored fish specimens were successfully analysed by this technique. The overall average recovery for 39 volatile compounds studied was 77% with an average s.d. of 20%. AS

21

Use of closed-system vacuum distillation for isolation of moderately volatile compounds.

Daniels, D. H.; Warner, C. R.; Birkel, T. J.

Journal of the Association of Official Analytical Chemists 64 (3) 769-771 (1981) [13 ref. En] [FDA, Div. of Chem. & Physics, Washington, DC 20204, USA]

A rapid, efficient vacuum distillation method has been used to quantitatively determine moderately volatile compounds in food-related samples. The following components and matrices were studied: 1,4-dioxane in polysorbate 65 and choline chloride; ethylene chlorohydrin in choline chloride, choline bitartrate, and cuminal; and epichlorohydrin, 1,3-dichloro-2-propanol, and 1-chloro-2-propanol in cornstarch. The matrix is slurried with water or aqueous methanol, frozen, and subjected to vacuum distillation. The distillate, which is free of salts and nonvolatile matrix components, is chromatographed on a gas chromatographic column and quantitated using a flame ionization detector. Foaming, which is a problem with purge and trap and azeotropic distillation procedures, does not occur. Recoveries of the components ranged from 85 to 101% at levels of 0.5-600 p.p.m. AS

22

Concentration and fractionation of aromas on reverse-phase adsorbents.

Parliment, T. H.

Journal of Agricultural and Food Chemistry 29 (4) 836-841 (1981) [10 ref. En] [General Foods Tech. Cent., White Plains, New York 10625, USA]

A new procedure for concentration and fractionation of volatile aroma chemicals has been devised. The dilute aroma-bearing aqueous solution is passed over a reversed-phase packing and concentration of the volatiles is achieved. A solvent gradient is generated and the aroma chemicals are desorbed. Retention of the aromatics is proportional to the number and type of hydrocarbon groups present; thus fractionation occurs. Fractions are obtained which may be subjected to organoleptic analysis, GLC, HPLC, or GLC-MS. Recoveries are generally >80%. Experimental details are discussed, and the technique is applied to a homologous series of methyl esters, a mixture of flavour chemicals, a peppermint oil, and a carbonated beverage. AS

23

[HPLC analysis of flavour compounds. II. Studies on flavouring essences, beverages and retail packs of vanilla- and vanillin-sugar.] Zur

hochdruckflüssigchromatographischen Analyse von Aromen. II. Untersuchung von Grundstoffen und Getränken sowie von Vanille- und Vanillin-Zuckern in Kleinpäckungen.

Jürgens, U.

Deutsche Lebensmittel-Rundschau 77 (6) 211-213 (1981) [22 ref. De, en, fr] [Landesuntersuchungsamt für das Gesundheitswesen Nordbayern, Henkestrasse 9-11, 8520 Erlangen, Federal Republic of Germany]

Studies on analysis for flavour compounds in foods and beverages by HPLC on a μ Bondapak column are described. No coumarin was detected in woodruff beverage bases manufactured by 5 makers. Of 17 samples of flavoured vodka, 3 had coumarin concn. exceeding the legal limit of 10 mg/l. None of 23 samples of quinine-containing soft drinks had quinine concn. exceeding the legal limit (85 mg/l). On the basis of the min. likely vanillin concn. in vanilla pods and the min. tolerance for 0.5 g vanilla pod/retail pack of vanilla sugar, it is calculated that each small retail pack of vanilla sugar should contain ≥ 5 mg vanillin. The commercial samples studied did not, however, reach this concn. Practical aspects of HPLC analysis of the samples studied are discussed. [See FSTA (1981) 13 (9A583 for part I.)] AJDW

24

[Examples for the solution of aroma problems using sensory profile methods.] Beispiele für die Lösung von Aromaproblemen mittels sensorischer Profilmethoden.

Rothe, M.; Engst, W.; Specht, M.

Chemie Mikrobiologie Technologie der Lebensmittel 7 (1) 1-8 (1981) [17 ref. De] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

Analysis of aromas in foods by profile analysis is discussed, with sections on the classification of sensory profile analysis, performance of profile analyses, presentation of results and areas of application, e.g. aroma problems in cheese, effect of temp. on the sensory profile of meat-type Maillard products, effect of raw material addition on sensory profile of meat broths, and effect of malt flour additions on sensory profile of rye bread. RAW

25

[HPLC determination of raspberry ketone in naturally and synthetically-flavoured raspberry products.] Hochdruckflüssigkeitschromatographische Bestimmung von Himbeerketon in natürlichen und künstlich aromatisierten Himbeerprodukten.

Fogy, I.; Grundmann, H.; Schmid, E. R.; Huber, J. F. K. *Deutsche Lebensmittel-Rundschau* 77 (8) 271-275 (1981) [11 ref. De, en, fr] [Inst. für Analytische Chem., Univ. Wien, A-1090 Vienna, Austria]

An HPLC method for detn. of (i) raspberry ketone [1-(4'-hydroxyphenyl)-3-butanone] in foods is described. (i) is extracted from the sample with dichloromethane, the solvent is evaporated off, the residue is dissolved in 2,2,4-trimethylpentane/dioxan (9:1) and separated by HPLC on a LiChrosorb Si 100 column, using 2,2,4-trimethylpentane/dioxan (9:1 v/v) mobile phase. Peaks in the eluate are determined by UV spectrometry. Interference may be eliminated by re-separation on a second column. Recovery is generally >80%, and was $\geq 61\%$ for all samples studied. Data are presented for (i) concn. in 19 samples of raspberry-flavour products; values ranged from ≤ 0.25 $\mu\text{g/g}$ to 3230 $\mu\text{g/g}$. Practically all the samples studied could reliably be classified as naturally or artificially flavoured. AJDW

26

Identification of 2-ethyl-hexanoic (2-ethyl-caproic) acid in beer.

Vinh, T.; Schwartz, G.; Moll, M.

Journal of the American Society of Brewing Chemists 39 (2) 44-46 (1981) [4 ref. En] [TEPRAL, 2 rue Gabriel Bour, F-54250, Champigneulle, France]

Analysis of beer volatiles by GLC in a high resolution capillary column revealed a number of compounds not separated from a carbon disulphide extract of beer on a packed column. Among these 2-ethyl-hexanoic acid was identified in beer for the first time. Its identification was supported by the results of electron impact ionization and chemical ionization. The mass spectra were determined on the free acid and its methylated derivative. In sensorial analysis, the addition of this acid to beer at levels of 1-50 mg/l created a particularly harsh taste. AS

27

[Rapid quantitative GLC analysis of the major water-soluble volatiles in orange juice.]

Sauri, E.; Nadal, I.; Alberola, J.; Sendra, J. M.; Izquierdo, L.

Revista de Agroquímica y Tecnología de Alimentos 21 (2) 276-280 (1981) [7 ref. Es, en] [Inst. de Agroquímica y Tecnología de Alimentos, Valencia, Spain]

A method is described for quantitative GLC detn. of the major water-soluble volatiles of orange juice (methanol, ethanol, acetaldehyde), by direct injection of 10 µl juice samples onto a Porapak Q column. Tabulated results show good reproducibility, with mean values (mg/l) 33 ± 0.52 (95% confidence interval), 651 ± 27.69 and 10 ± 0.94 mg/l resp.; results are similar to those obtained by COD detn. [see Dougherty, *Food Technology* (1968) 22, 1455-1456], but the GLC method is faster and allows quantitative detn. of single compounds. RM

28

[GLC identification of phenolic acids in morello cherry and sweet cherry juice.] Gaschromatische Identifizierung von Phenolsäuren im Saft von Sauerkirschen und Süßkirschen.

Tantshev, S.; Iontsheva, N.; Genov, N.; Maltshev, E. *Flüssiges Obst* 48 (4a) 214-215 (1981) [1 ref. De] [Hochschule für Lebensmittelind., Plovdiv, Bulgaria]

Laboratory pressed juices from 5 var. of sour (morello) cherries and 1 of sweet cherries were analysed by GLC. 8 phenolic acids (salicylic, cinnamic, gentisinic, shikimic, quinic, *p*-coumaric, gallic and isoferulic) were identified by internal standards. Retention times are tabulated. RM

29

Polyphenolic pigments content of clonal and seedling black teas.

Thanaraj, S. N. S.; Ramaswamy, S.

Journal of the Institution of Chemists (India) 53 (3) 89-91 (1981) [6 ref. En] [Div. of Tea Tech., UPASI Tea Res. Inst., Cinchona-642 106, India]

The contents of polyphenolic pigments - theaflavins, thearubigins, and highly polymerized substances - in 22

clonal black teas are reported. The pigment contents of teas manufactured by the CTC method were compared with those of teas made by the orthodox method. The CTC teas appeared to have higher levels of the 3 aforementioned constituents, and also a higher proportion of theaflavins in the total pigments. CFTB

30

[Gas chromatography analyses of medium- and high-boiling sulphur volatiles in beer.]

Matsui, S.; Amaha, M.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 54 (8) 629-636 (1980) [19 ref. Ja, en] [Cent. Res. Lab., Asahi Breweries Ltd., Ohmori-kita, Ohta-ku, Tokyo 143, Japan]

The purpose of the study was to investigate the major components that contribute to the sulphury and yeasty flavour of beer. Volatile S compounds were extracted from beer with dichloromethane or ethyl acetate and subjected to gas chromatographic analysis using a flame photometric detector (FPD-GC) and GC-MS. Dichloromethane extracts of lager beer usually produced 4 predominant peaks on FPD-GC, and these were identified as 3-methylthiopropyl acetate (methionol), 3-methylthiopropyl acetate, 2-methyl-tetrahydrothiophene-3-one, and dimethyl sulphoxide (DMSO). Ethyl acetate extracts of beer subjected to FPD-GC after methylation had 4 or 5 main peaks corresponding to 2-methylthioacetic acid, 3-methylthiopropionic acid, 2-hydroxy-4-methylthiobutanoic acid, and 1 or 2 unidentified components. Most of these S compounds were found to be present in beers of several different brands at concn. of 1-68 µg/l, while methionol and DMSO were present at 0.4-2.3 ml/l. Changes in the quantities of these S volatiles during the brewing process were pursued and discussed. AS

31

[Chemical composition of Portuguese brandies. I. Propanol, isobutanol and methylbutanol in wine brandies.]

Sena-Esteves, F.; Freire, O.; Guerra, F. C.

Agronomia Lusitana 40 (2) 115-124 (1980) [12 ref. Pt, en] [Cent. de Citologia Exp., Univ. do Porto, P-4000 Porto, Portugal]

90 samples of Portuguese brandies (alcohol concn. approx. 77% v/v) from various sources were analysed for the title compounds by GLC. Mean values and ranges were (mg/dl ethanol): propanol 24.2 and 9.8-38.9; isobutanol 75.4 and 36.4-140.0; and methylbutanol isomers 179.6 and 77.2-291.4. Mean values for ratios between these components were: methylbutanol:isobutanol 2.38; methylbutanol:propanol 7.54; and isobutanol:propanol 3.19. These results are discussed in relation to literature data for brandies in other countries. AJDW

Changes in aroma compounds during ageing of young table and dessert wines.]

Avakyan, S. P.; Kataeva, T. V.

Vinodelie i Vinogradarstvo SSSR No. 4, 12-16 (1980) [Ru][VZIPP, USSR]

Variations in contents of aldehydes, higher alcohols and esters in young table and dessert wines during ageing under aerobic and anaerobic conditions at various temp. were investigated. Ageing and heating of the wine lowered the concn. of nitrogenous substances, increased optical density at 280 nm and depressed the reducing capacity. Addition of yeasts, oakwood chips and O₂ had a considerable influence on the chemical and biochemical changes occurring in the wine. Alcohol oxidation rose with increasing wine temp.; aldehyde formation and ester and acetal synthesis were accelerated and the carbonyl-amino reaction was intensified. These processes were found to be responsible for variations in the composition of the aroma compounds and the quality parameters of the wine. STI

33

[Chemical composition of Portuguese brandies. II. 1-butanol and 2-butanol in brandies.]

Freire, O.; Sena-Esteves, F.; Guerra, F. C.

Agronomia Lusitana 40 (2) 125-128 (1980) [4 ref. Pt, en][Cent. de Citologia Exp., Univ. do Porto, P-4000 Porto, Portugal]

127 brandies were screened for use in port or for ageing. Max. content of 1-butanol was 108 mg/dl ethanol; in 13 samples it was not detected. In almost all samples, 2-butanol contents were higher, with a max. of 182.4 mg/dl ethanol; all samples showed at least traces of it. 40 samples had 1-butanol contents > 3 mg/dl, or 2-butanol contents > 5 mg/dl ethanol, or both. [See preceding abstr. for part I.] AS

34

[Problems of quality evaluation of roast coffee by quantitative trace analysis of volatile aroma compounds.] Zur Problematik der Qualitätsbeurteilung von Röstkaffee durch quantitative Spurenanalyse flüchtiger Aromakomponenten.

Radtke-Granzer, R.; Piringer, O.-G.

Deutsche Lebensmittel-Rundschau 77 (6) 203-210 (1981) [13 ref. De, en, fr][Fraunhofer-Inst. für Lebensmitteltech. & Verpackung, Schragenhofstrasse 35, 8000 Munich 50, Federal Republic of Germany]

Studies were conducted on the use of aroma compounds of mol. wt. < 100 as indices of the sensory quality of roast coffee; aroma volatiles were analysed by GC-MS. Studies were conducted on good-quality commercial samples of coffee of 15 brands. Data are presented for concn. of 2-methylpropanal, 3-methylbutanal, diacetyl, 2-methylfuran and the sum of these compounds. Variability of concn. of the individual aroma compounds is discussed; mean total concn. of the 4 compounds studied was 110 ± 21 mg/kg. Studies were also conducted on changes in sensory quality and volatiles concn. in coffees stored in conventional or airtight packs for various periods and at various temp. Tables of results are given. Deterioration rate tended to increase with increasing temp. and O₂ concn. For all storage variables, a decrease in total concn. of the

above 4 volatiles below 89 mg/kg was associated with clearly detectable loss of sensory quality. It is suggested that this could be used as an objective test for the quality of coffee. AJDW

35

Structural collapse and volatile retention during heating and rehumidification of freeze-dried tomato juice.

Gerschenson, L. N.; Bartholomai, G. B.; Chirife, J.

Journal of Food Science 46 (5) 1552-1556 (1981) [En][Dep. de Ind., Univ. de Buenos Aires, 1428 Buenos Aires, Argentina]

The effects of temp., moisture content, and pectin addition on the "collapse" of freeze-dried tomato juice cake and retention of volatiles were investigated. High temp. and high moisture contents induced collapse and the loss of volatiles, which was measured, with ¹⁴C-labelled butyl acetate. The addition of pectin, which enhanced the viscosity of the tomato juice, increased its "collapse" temp. after freeze-drying and the retention of volatiles. IFT

36

[Aroma characteristics of kabusecha (shaded green tea).]

Kawakami, M.; Yamanishi, T.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 55 (2) 117-123 (1981) [14 ref. Ja, en][Ibaraki Christian Junior Coll., Hitachi-shi, Ibaraki 319-12, Japan]

Kabusecha made from tea leaves grown in the shade is one of the best quality green teas. It has a characteristic refreshing greenish aroma, called "ooika". The essential oils from kabusecha and sencha (typical Japanese green tea made from tea leaves grown in an open field) and their fresh leaves were analysed by gas chromatography MS and the aroma compositions were compared to find the contributory factors to "ooika". Marked differences were found between the essential oils from kabusecha and sencha, while no significant differences were observed in their fresh leaves. Kabusecha contained large quantities of the ionone series compounds, such as α -ionone, β -ionone, 2,6,6-trimethyl-2-hydroxycyclohexan-1-one and 4-(2,6,6-trimethyl-1,2-epoxycyclohexyl)-3-buten-2-one. The latter 2 compounds were newly identified from green tea. Carotenoids in kabusecha and sencha and their fresh leaves were determined by spectrophotometric analysis. Fresh leaves of kabusecha contained 1.5 \times more carotenoids than fresh leaves of sencha. The ionone series aroma compounds must be formed from carotenoids during the green tea manufacturing process and contribute to the "ooika" of kabusecha. AS

37

[Aroma and its preservation in early spring green tea (Shin-cha).]

Hara, T.; Kubota, E.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 26 (9) 391-395 (1979) [5 ref. Ja, en][Nat. Res. Inst. of Tea, Kanaya-cho, Shizuoka-ken, Japan]

Changes in the aroma compounds of early spring green tea during storage were examined by GLC-MS and by sensory evaluation. The major aroma compounds, *n*-nonylaldehyde and *cis*-3-hexanylhexasanoate, decreased considerably during

storage. Sensory evaluation indicated that *cis*-3-hexenylhexanoate contributes to the typical aroma of this tea. Propionaldehyde, 1-penten-3-ol, *cis*-2-penten-1-ol and 2,4-heptadienal were not detected in fresh tea but were produced during storage. The aroma of the tea was preserved intact only by storage at -70°C . Some loss of aroma occurred during storage at 5°C and during storage in N_2 gas at room temp. [From En summ.] JA

38

[Effect of ^{60}Co γ -rays on green coffee beans. II. Changes in taste and in the composition of carboxylic acids induced in brewed coffee by γ -irradiation of green beans and storage of roast beans.]

Tomoda, G.; Matsuyama, J.; Nagano, A.; Namatame, M.; Morita, Y.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 27 (2) 68-74 (1980) [16 ref. Ja, en] [Fukushima Women's Junior Coll., 1-1 Miyashiro Chigoike, Fukushima, Japan]

Brazilian Santos green coffee beans were irradiated with ^{60}Co γ -rays at doses of 0, 0.05, 0.5 and 1.5 Mrad. Subsequent studies involved detn. by GLC of the carboxylic acid composition of the beans after roasting and evaluation by the cup test of the organoleptic quality of the beans after roasting and storage. The total acid content immediately after roasting was approx. 6000 mg/100 g beans; a ratio of 73:18:7:2 was found for chlorogenic acid:hydroxycarboxylic acid:monocarboxylic acid:other carboxylic acids. Irradiation of the green beans and subsequent storage after roasting had a marked effect on the flavour of fresh coffee, this effect being due to changes in the carboxylic acid composition. Such changes were more apparent on irradiation than during storage. Results indicated that coffee quality is more closely related to the hydroxycarboxylic acid:monocarboxylic acid ratio than to the total carboxylic acid content. [From En summ.] JA

39

3,5-diethyl-1,2,4-trithiolane from *Allium cepa*.

Kameoka, H.; Demizu, Y.

Phytochemistry 18 (8) 1397-1398 (1979) [10 ref. En] [Dep. of Applied Chem., Kinki Univ., Kowakae, Higashiosaka-shi, Osaka, Japan]

40

High-performance liquid chromatographic separation of shallot volatile oil.

Wu, J. L.-P.; Wu, C.-M.

Journal of Chromatography 214 (2) 234-236 (1981) [5 ref. En] [Food Ind. Res. & Development Inst., PO Box 246, Hsinchu 300 Taiwan]

Volatile oil from shallots was separated by HPLC and > 90 peaks were detected by a UV detector (254 nm). The resolution obtained by HPLC is better than that by capillary column GLC which gives < 90 peaks. 6 fractions obtained by HPLC separation were identified directly by gas chromatography-MS without concn., i.e. dimethyl trisulphide, 1-methylthiopropyl ethyl disulphide, methyl propyl trisulphide, dipropyl trisulphide (2 peaks), and propyl propenyl trisulphide. Most other fractions have not yet been analysed. AL

41

[Effect of lipids [olive oil] on retention of volatile compounds. I. Experimental determination of activity coefficients.]

Allaneau, B.; Nicolas, J.; Montenay-Garestier, T.; Drapron, R.

Sciences des Aliments 1 (3) 447-465 (1981) [23 ref. Fr, en] [Lab. de Tech. Alimentaire de l'INRA, 91305 Massy, France]

42

Detection of carbonyl sulphide in Cheddar cheese headspace.

Aston, J. W.; Douglas, K.

Journal of Dairy Research 48 (3) 473-478 (1981) [14 ref. En] [Dep. of Primary Ind., Otto Madsen Dairy Res. Lab., George Street, Hamilton, Queensland 4007, Australia]

Carbonyl sulphide (COS) was detected in the headspace of Cheddar cheeses in concn. ranging from 0.01 to 0.3 ng/ml. It was also found in the headspace above certain packaging materials and sealing materials used in the analytical procedures. Evidence that COS was produced within the cheese was given by the findings that experimental cheese containing added cysteine had consistently more COS (up to 1.0 ng/ml) and that COS could be produced chemically from mixtures of cysteine or methionine with riboflavin and ascorbic acid in laboratory trials. AS

43

Study of the flavor and consistency problem in Cheddar cheese made from buffalo milk.

Al-Fayadh, M. H.

Dissertation Abstracts International, B 41 (2) 508-509; Order no. 80-17910 (1980) [En] [Univ. of Illinois, Urbana, Illinois 61801, USA]

Hard consistency of cheese made from buffaloes' milk was due to its low moisture content when processed conventionally. Higher heat treatment of the milk increased the moisture content and allowed normal syneresis of the curd on pressing, resulting in a lower salt-in-moisture ratio that promoted normal acid development and proteolysis. Higher heat treatment of the milk improved the development of Cheddar flavour, it also caused an appreciable increase in free fatty acid (FFA) content of the cheese, the effect being greater than that produced by addition of food-grade enzymes (FGE) to the curd. A relationship was shown between degree of ripening and acid-soluble protein (ASP) content of untreated cheeses, and buffaloes' milk cheeses made with 'non-bitter' starter developed more ASP than those made with 'bitter' starter. Extensive breakdown of α - and β -casein occurred in cheeses with added FGE, but added slurry had little or no effect on electrophoretic patterns on polyacrylamide gel. CDP

44

Modified colorimetric method for determining indole in shrimp.

Cheuk, W.; Finne, G.

Journal of the Association of Official Analytical Chemists 64 (4) 783-785 (1981) [8 ref. En] [Seafood Tech. Sect., Texas A&M Univ., College Station, Texas 77843, USA]

A modified spectrophotometric method for measuring indole in shrimp is described. The method was developed to eliminate the time-consuming steam distillation and expensive instrumentation required by the official AOAC methods. Indole is extracted with

light petroleum from trichloroacetic acid-precipitated shrimp muscle. The extracted indole, soluble in light petroleum, is reacted and re-extracted with Ehrlich's reagent; indole in the form of a rose indole complex can be determined spectrophotometrically. When shrimp at various degrees of decomposition were analysed for indole by the modified method as well as by the official AOAC colorimetric method, the correlation coeff. between the data from the methods was 0.98. AS

45

[Taste compounds of fresh-water fishes. II. Organic bases in the muscle of wild common carp.]

Yang, S. T.; Lee, E. H.

Bulletin of the Korean Fisheries Society 13 (3) 109-113 (1980) [25 ref. Ko, en] [Dep. of Food & Nutr., Dongju Women's Junior Coll., Busan, S. Korea]

The organic bases in the dorsal flesh of wild common carp, *Cyprinus carpio*, were analysed. No significant difference was found between flesh from the male and female in the contents of total creatinine, betaine, trimethylamine (TMA) and trimethylamine oxide (TMAO). The most abundant basic compound was total creatinine, reaching 400 mg%. The amount of betaine was 66.5%, and traces of TMA and TMAO were found. KoSFoST

46

[Taste compounds of fresh-water fishes. III. Taste compounds of Korean snakehead meat.]

Yang, S. T.; Lee, E. H.

Bulletin of the Korean Fisheries Society 13 (3) 115-119 (1980) [24 ref. Ko, en] [Dep. of Food & Nutr., Dongju Women's Junior Coll., Busan, S. Korea]

The taste components of the dorsal muscle of Korean snakehead, *Channa argus*, were analysed. The total free amino acid consisted of 63% glycine and abundant amounts of taurine, alanine and lysine. Among the nucleotides, IMP was the most abundant at a concn. of 2.78 $\mu\text{mol/g}$ muscle. Total extractive N consisted of 43% total creatinine N, 0.8% betaine N and traces of trimethylamine N and trimethylamine oxide N. [See preceding abstr. for part II.] KoSFoST

47

Ultraviolet detection procedure for liquid chromatographic determination of indole in shrimp.

Chambers, T. L.; Staruszkiewicz, W. F., Jr.

Journal of the Association of Official Analytical Chemists 64 (3) 603-606 (1981) [2 ref. En] [FDA, Div. of Food Tech., Washington, DC 20204, USA]

In a UV detection procedure, indole was extracted from shrimp by blending with carbonate buffer and then partitioned into ethyl acetate. Before quantitation by HPLC, interferences were removed by the use of a polyamide cleanup column. Concentrated column effluent was injected into the chromatograph. Indole was detected by monitoring absorbance at 217 nm and quantitated by comparison of indole peak height to that of an internal standard, 2-methylindole. Recoveries of indole ranged from 72 to 117%. Results agreed well with those by the official AOAC GLC method. AS

48

Methyl 3,4-dimethyl-5,6-dihydro- α -pyran-6-carboxylate in roast beef volatiles: identification and synthesis.

Lee, K. N.; Ho, C.-T.; Giorlando, C. S.; Peterson, R. J.; Chang, S. S.

Journal of Agricultural and Food Chemistry 29 (4) 834-836 (1981) [8 ref. En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ. of New Jersey, New Brunswick, New Jersey 08903, USA]

The little compound was identified in the volatiles isolated from roast beef. This compound was synthesized by Diels-Alder reaction between methyl glyoxylate and 2,3-dimethyl-1,3-butadiene. The structure of the synthesized compound was established by IR, NMR, and mass spectroscopy. Identification of the title compound in the volatiles of roast beef was confirmed by comparing the mass spectrum with that of the authentic sample. AS

49

[Flavour extraction process.]

Asahi Kasei Kogyo KK

Japanese Examined Patent 5 611 424 (1981) [Ja]

Process for extracting flavouring agents from e.g. meat, fish, coffee, tea, employs extraction with liquid dimethyl ether. The process is especially useful for the production of instant coffee and tea. AS

50

[Identification of some volatile components of ground cloves.] Identifizierung einiger flüchtiger Inhaltsstoffe von gemahlenen Gewürznelken.

Koller, W.-D.

Zeitschrift für Lebensmittel-Untersuchung und -Forschung 173 (2) 99-100 (1981) [6 ref. De, en] [Inst. für Lebensmittelchemie, Engesser Str. 20, D-7500 Karlsruhe, Federal Republic of Germany]

Volatile components of ground cloves were enriched by 'extraction' with He and condensation in a metal capillary tube cooled with liquid air. 40 compounds were resolved from the extract by gas chromatography on UKON 50 LB X in a 24 ft \times 1/8 in stainless steel column with flame ionization detection. 9 compounds were positively identified by gas chromatography/MS, these are acetone, methyl acetate, methanol, ethyl acetate, α -pinene, β -pinene, myrcene, α -terpinene and limonene. DIH

51

Gas chromatographic analysis of furaneol.

Williams, A. A.; Mottram, D. S.

Journal of High Resolution Chromatography and Chromatography Communications 4 (8) 421-422 (1981) [24 ref. En] [Food & Beverages Div., Long Ashton Res. Sta., Long Ashton, Bristol BS18 9AF, UK]

5 types of capillary column coated with CW 20M were compared for analysis of furaneol (an important flavour compound) at 2000 and 100 p.p.m. in diethyl ether: a stainless steel, 2 types of borosilicate glass, a commercial glass and a fused silica column. Results illustrate the advantage of fused silica capillary columns for the analysis of potentially unstable compounds, and offer an explanation of the discrepancy between reports by various workers regarding the presence of the compound in various foods and beverages. RM

52

[N-nitroso compounds in foods.]

Kubacki, S. J.; Kubacka, W.

Przemysł Spożywczy 35 (2) 47-51 (1981) [3 ref. Pl, ru, en, fr, de]

This review-type article deals with main physical and chemical properties, formation, carcinogenic activity, occurrence, and main precursors of volatile N-nitroso compounds in foods. Analytical methods for volatile and non-volatile N-nitroso compounds are also considered. SKK

53

[Measurement of odours: the differential olfactory stimulator (Stod).]

Guillet, P.; Gomes, A.; MacLeod, P.

Industries Alimentaires et Agricoles 98 (3) 191-193 (1981) [Fr]

The design and operation of the Stod apparatus are described. The apparatus makes use of the independent rapeseed meal and its fractions were compared, i.e. the Reinecke salt method [see *Journal of Agricultural and Food Chemistry* (1968) 16, 132-135] and the TiCl₄ method of Ismail et al. [see *FSTA* (1980) 12 1A29]. The latter method is more easily performed, but it gives accurate results only when interfering phenolic compounds are removed. IN

54

Pyridines in foods. [Review]

Maga, J. A.

Journal of Agricultural and Food Chemistry 29 (5) 895-898 (1981) [81 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado 80523, USA]

In this review of the role of pyridine compounds in food flavour, the relatively few foods in which pyridines have been detected are tabulated (these foods had all received some form of heat or microbial treatment); the flavour properties of various substituted pyridines are described (they are usually associated with burnt, bitter, roasted or green flavours); and formation of pyridines in model systems is discussed. DIH

55

Mass spectrometry in food analysis. [Review]

Horman, I.

Biomedical Mass Spectrometry 8 (9) 384-389 (1981) [37 ref. En] [Nestle Products Tech. Assistance Co. Ltd., Res. Dep., 1814 La Tour de Peilz, Switzerland]

Aspects of the use of MS in food analysis discussed include identification of aroma volatiles, amino acids and vitamins, detn. of structural information on new carbohydrates, identification of steroids in adulterated butter and cocoa butter, and location of double bonds in unsaturated fatty acids. Trace component analysis is aided by MS either for identity conformation or in quantitation; single ion monitoring has been used for a number of contaminants such as polyhalogenated biphenyls, vinyl chloride monomer and patulin. Relative abundance of isotopes can be used to distinguish between synthetic and natural materials, different plant sources or between natural fruit juice and concentrated and reconstituted juice. Developments seen as important are coupling of HPLC to MS, and use of tandem MS analyses with collision activated decomposition. DIH

56

[Rapid determination of sulphur dioxide (SO₂) in foods.]

Lissoni, M.

Industria Alimentari 20 (4) 284-285 (1981) [It]

The Kjeltex System I distillation unit, suitable for use with meat products, dried fruits and vegetables, other fruit products and jams, sugar or starch syrups, beer, wine and gelatin, needs only 6 min for SO₂ detn., whereas the standard method [Monier & Williams, (1927) *Analyst* 52, 343-415] needs 1-5 h. Alternative procedures for using the system are reported in detail. KME

57

[Flavour stability.] Geschmacksstabilität

Drost, B. W.

Brauwelt 121 (21) 786, 788-790 (1981) [De, en]

[Heineken Tech. Beheer BV, Zoeterwoude, Netherlands]

Flavour stability of beer is discussed, with special reference to the stale flavour caused by nonenal; the nonenal is formed from 9,10,13-trihydroxy-11-*trans*-octadecanoic acid formed by lipid oxidation. Factors influencing formation of nonenal are discussed, with reference to the barley used, mashing, beer pH, addition of reducing agents, filtration, and the brewing process. Adsorption of the trihydroxyoctadecanoic acid on particulate matter during clarification is considered as a possible means of removing this precursor, and hence reducing the likelihood and severity of incidence of nonenal off-flavour. AJDW

58

[Effect of SO₂ on determination of diacetyl in beer by the Hetzel/Gjertsen method.]

Buijnsters, H. J.

Voedingsmiddelentechnologie 14 (11) 12-15 (1981) [7 ref. Nl, en] [Skol Brouwerijen NV, Breda, Netherlands]

Interference of SO₂ with detn. of diacetyl in beer by the Hetzel/Gjertsen method [see *Milchwissenschaft* (1959) 14, 424 & *Monatschrift für Brauerei* (1964) 17, 232] is discussed. Diacetyl forms a stable complex with SO₂ which is not separated during the steam distillation stage of the analysis. Studies were conducted on use of added HgCl₂ to liberate diacetyl from the complex; tables of results are given. In aqueous model solutions, added HgCl₂ eliminated interference by ≤ 3 mg SO₂/l; at higher SO₂ concn., recoveries of diacetyl were increased by addition of HgCl₂, but remained $< 100\%$. In beer, added HgCl₂ eliminated interference by SO₂ even at SO₂ concn. of 10 mg/l. Free diacetyl/total diacetyl ratios in 6 commercial beers differed considerably, and were not clearly related to SO₂ concn. Changes in free and total diacetyl concn., SO₂ concn. and diacetyl flavour in beers (with addition of 0, 0.1, 0.2 or 0.3 mg diacetyl/l) during storage for ≤ 13 wk at 25°C were studied; tables and graphs of results are given. Free diacetyl concn. increased with increasing storage time, probably due to decreases in SO₂ concn. In some samples, a diacetyl flavour was detectable at diacetyl concn. ≤ 0.10 mg/l. AJDW

59

Determination of methyl and ethyl mercaptans in lager beer.]

Matsui, S.; Eto, M.; Amaha, M.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 54 (8) 621-628 (1980) [17 ref. Ja, en] [Cent. Res. Lab., Asahi Breweries Ltd., Ohmori-kita, Ohta-ku, Tokyo 143, Japan]

A porous polymer, Porapak Q, was used as a packing material to concentrate trace amounts of volatile S compounds in beer. H₂S, dimethyl sulphide (DMS), methyl mercaptan (MeSH), ethyl mercaptan (EtSH) and other volatile agents in the concentrate were analysed by gas chromatography with a flame photometric detector. This newly developed technique enabled quantitative detn. of MeSH and EtSH in wort and beer. MeSH was present at levels as high as 2-4 µg/l in hopped worts but rapidly decreased to 0.1-0.2 µg/l in 2-3 days after yeast pitching and then increased gradually to 0.6-0.8 µg/l by the end of primary fermentation. Beer MeSH content changed little during the lagering process, but EtSH was entirely absent in hopped worts, and emerged during fermentation, reaching a max. level (0.3-0.7 µg/l) at the end of 6-7 days of main fermentation, and then decreased during lagering to ≤0.1 µg/l. After bottling, EtSH disappeared rapidly, while MeSH persisted in bottled beer and increased gradually with storage time at higher temp. (45°-60°C). [From En summ.] AS

60

[Effect of SO₂ and sulphate contents of the malt on the SO₂ and sulphate contents of corresponding worts and beers.] Über den Einfluß der Schwefeldioxid- und Sulfatgehalte von Malzen auf die Schwefeldioxid- und Sulfatgehalte in Würzen und Bieren.

Narziss, L.; Reicheneder, E.; Kroiher, A.

Brauwissenschaft 34 (2) 33-41 (1981) [14 ref. De, en, fr] [Lehrstuhl & Lab. für Tech. der Brauerei I, Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Examination of numerous trade malts has shown that the SO₂ content of a malt depends on the following factors: quantity of S used during the kilning process; S content of the fuels applied; duration of sulphuring, which if possible should extend throughout the whole of the drying process in the kiln; and the kilning schedules for pale and dark malts, the latter always having lower SO₂ concn. The sulphate content of the malt follows the same trends. When S is applied at the rate of 20 g/100 kg malt 50% is recovered in the form of SO₂ and SO₄²⁻. At the rate of 100 g S/100 kg the recovery is only 20%. For dark malts it is even lower. Small-scale brews were carried out with malts treated with specific levels of S in indirectly heated kilns. A highly-sulphured malt yielded a max. level of 1 mg SO₂/l in the unboiled wort. The pitching wort was almost free of SO₂. No proof could be found that the SO₂ content of the wort depended on the sulphate content of the brewing liquor. In beer, SO₂ levels of up to 2 mg/l were found; this is probably due to the sulphur metabolism of the yeast. It is concluded that, generally, sulphate-rich brewing liquors and highly sulphured malts yield beers with the highest SO₂ contents; the limit value of 10 mg SO₂/l is never exceeded by much. The sulphate content of the beer increases with increasing sulphuring and is enhanced by the sulphate content of the brewing liquor.

61

[Volatile halogenated hydrocarbons in raw and drinking water of Turku.]

Kroneld, R.; Reunanen, M.; Wahlroos, G.

Kemia-Kemi 8 (3) 141-143 (1980) [12 ref. Fi, en]

Volatile halogenated hydrocarbons were analysed in raw water from the river Aurajoki and drinking water in Turku. The use of chlorine for disinfection purposes is dramatically increasing the concn. of these compounds in drinking water, even though NH₄⁺ has a counteracting effect by reacting with aqueous chlorine. Concn. are also increasing in the waterpipe networks. Not only must excessive chlorination be avoided, but premonitoring of water, at present quite insufficient in waterworks, should receive more attention. Active charcoal filtration does not eliminate volatile halogenated hydrocarbons. Even though there was no prechlorination during the research period and some caution was taken with post-chlorination, the total trihalomethane content during the autumn exceeded unofficial limit values established in the USA. Analytical investigations of organic material at present cover only about 1/4 of total organic material present. Water quality is absolutely vital to public health and it is suggested that biological tests must be used to achieve more data for water quality control. AS

62

Design of aeration towers to strip volatile contaminants from drinking water.

Kavanaugh, M. C.; Trussell, R. R.

Journal American Water Works Association 72 (12) 684-692 (1980) [19 ref. En] [James M. Montgomery, Consulting Engineers Inc., Washington, DC, USA]

63

Volatile amines: determination in grapes, musts and wines.

Daudt, C. E.

Dissertation Abstracts International, B 41 (12) 4512: Order no. 811984, 131pp. (1981) [En] [Univ. of California, Davis, California 95616, USA]

A new method is described for amine quantification in wine, involving double vacuum distillation, derivatizing with trifluoroacetic anhydride, extraction with ether after sodium bicarbonate wash, concn. with a N₂ stream, and gas chromatography of the sample. Recovery and reproducibility studies using Cabernet Sauvignon, White Riesling, Pinot noir, Chenin blanc wines, and sherry (baked and flor) are presented. 2 amines, i.e. 2-methyl butyl (α-amyl) and diethyl amine were reported for the first time in grapes or wine. It is postulated that most volatile amines are not formed on fermentation, but that they are made in grapes by decarboxylation of amino acids and amination of aldehydes. LH

64

[Gas chromatographic characterization of brandy, Cognac and Armagnac. II. Content of volatiles.]

Gaschromatographische Charakterisierung von Weinbrand, Cognac und Armagnac. II. Gehalte an flüchtigen Inhaltsstoffen.

Postel, W.; Adam, L.

Branntweinwirtschaft 120 (10) 154-164 (1980) [48 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

43 samples of German brandy, 16 samples of Cognac

and 11 samples of Armagnac were analysed for volatiles by GLC. Tables and block diagrams are given for concn. of 9 carbonyl compounds, 17 alcohols, 3 terpenes and 24 esters. In all 3 brandy types, acetaldehyde, 1,1-diethoxyethane and furfural were the predominant carbonyl compounds; isoamyl alcohol, isobutanol, propanol-1 and methanol were the predominant alcohols and ethyl acetate and ethyl lactate were the predominant esters. Differences between the 3 brandy types are discussed. Variability of volatile compound concn. in German brandies is much greater than in Cognac or Armagnac, probably as a result of the more varied raw materials and distillation methods of German brandy. The potential for use of concn. of certain volatiles for evaluation of the quality and authenticity of brandies is discussed. [See FSTA (1980) 12 8H1200 for part I.] AJDW

65

[Studies on off-flavour formed during storage of satsuma mandarin juice. II.]

Shimoda, M.; Furukawa, F.; Miyake, M.; Osajima, Y. *Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi]* 55 (1) 23-30 (1981) [14 ref. Ja, en][Lab. of Food Analysis, Dep. of Food Sci. & Tech., Fac. of Agric., Kyushu Univ., Fukuoka 812, Japan]

Fresh juice and reconstituted concentrate of Satsuma mandarin were stored at 40°C. The volatile compounds were determined by an internal standard method after 0, 10, 20, 30, 50 and 75 days storage. For low boiling compounds, the headspace gas of the juice was analysed by GLC, while for higher boiling compounds, the extract recovered from the juice by low temp. distillation and ether extraction was analysed by gas chromatography-MS. Of the low boiling compounds (acetaldehyde, dimethyl sulphide, acetone, methanol, ethanol), dimethyl sulphide increased remarkably during storage. Dimethyl sulphide was organoleptically the most detrimental compound in juice containing a little peel oil. In higher boiling compounds, the contents of furfural, terpinen-4-ol, β -terpineol, α -terpineol and fenchyl alcohol increased, whereas those of β -pinene, citronellal, linalool, β -elemene, geranyl acetate and several oxygenated terpenes decreased. Terpinen-4-ol, β -terpineol, α -terpineol and fenchyl alcohol imparted a musty or piney odour to the juice, and fenchyl alcohol was reported for the first time as a degradation product of the off-flavoured juice. As furfural content increased linearly with storage time, it may be a useful indicator of the storage time of Satsuma mandarin juice. [See FSTA (1981) 13 8H1247 for part I.] AS

66

Relationships of apple sensory attributes to headspace volatiles, soluble solids, and titratable acids.

Watada, A. E.; Abbott, J. A.; Hardenburg, R. E.; Lusby, W.

Journal of the American Society for Horticultural Science 106 (2) 130-132 (1981) [7 ref. En][Hort. Crops Quality Lab., Sci. & Education Administration, Agric. Res., USDA, Beltsville, Maryland 20705, USA]

Correlations between sensory attributes and concn. of headspace volatiles, soluble solids, and titratable

acids of 'Golden Delicious' and 'York Imperial' apples (*Malus domestica*) were examined. Stepwise regression analysis indicated that variation of sweetness of 'York Imperial' and acidity of 'Golden Delicious' and 'York Imperial' can be accounted for in part by soluble solids, titratable acids, and headspace volatiles of apples. Astringency, mustiness, starchiness, and floral-fruityness correlated poorly with the same analytical measures. AS

67

No flavor changes detectable in triforine-treated highbush blueberries.

Byther, R. S.; Bristow, P. R.

HortScience 15 (2) 152 (1980) [2 ref. En][W. Washington Res. & Extension Cent., Puyallup, Washington 98371, USA]

Triangular comparison sensory evaluation tests indicated that there were no detectable changes in the flavour of 'Concord' highbush blueberries (*Vaccinium corymbosum* L.) following spray treatments with 2

formulations of the fungicide triforine. Time of harvest (early vs. late) following the fungicide applications had no influence on the judges' decisions. This data is part of the information required by the Environmental Protection Agency to effect registration of this fungicide, which is a successful control measure against mummy berry disease. AS

68

[Studies on the composition of a flavour and aroma extract from onions.] Untersuchungen über die Zusammensetzung eines Geschmacks- und Geruchsextraktes aus Zwiebeln.

Tokarska, B.; Karwowska, K.

Nahrung 25 (6) 565-571 (1981) [15 ref. De, en, ru][Inst. for the Fermentation Ind., Warsaw, Poland]

Flavour and aroma extracts obtained by dichlorodifluoromethane extraction of comminuted onions were studied using gas chromatography, MS, IR spectroscopy and NMR spectroscopy. Flavour and aroma were attributable to sulphur compounds, mainly di- and trisulphides with methyl, propyl and *cis*- or *trans*-propenyl groups, as well as thiopene derivatives; large quantities of 2-methyl-pentanal and 2-methyl butanal were detected. One component, 3,4-dimethyl-2,5-dioxo-2,5-dihydrothiophene was identified for the first time. IN

69

[Flavour of apple jam.]

Abe, E.; Ito, T.; Odagiri, S.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 54 (9) 761-764 (1980) [15 ref. Ja, en][Morioka Junior Coll. of Iwate Prefecture, Sumiyoshi, Morioka 020, Japan]

Samples of the sweet aroma of apple jam were collected during jam processing and were analysed by gas chromatography-MS. The sweet aroma was considered to be produced while the apple and sugar were cooked together. 9 components, already known as apple volatiles, nerolidol and 4 furan compounds were identified, and a further 7 components were tentatively identified. The sweet aroma of apple jam consisted

mainly of alcohols and esters in the apple volatiles, and volatiles formed during cooking, prominent among which was 5-methyl-2-furfural. Further components having a jam-like sweet aroma were found by sniffing the gas chromatography column out flow, but have not yet been identified. [From En summ.] JRR

70
[Studies of the quality index of canned agricultural foods. V. Volatile components of canned peach.] Mori, M.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 24 (5) 215-220 (1977) [8 ref. Ja, en] [Res. Lab. of Canners Ass. of Japan, 460, Kariba-cho, Hodogaya-ku, Yokohama-shi, Kanagawa-ken, Japan]

Volatile components extracted from canned samples of 6 peach cv. were examined by GLC, GLC-MS and silica gel column chromatography. No qualitative differences were found between the cv. Approx. 75-80 volatile components were found. Those identified included γ C6- γ C10 lactones, δ C10 lactones, γ C12 lactones, benzaldehyde, heptadecane, benzyl alcohol and β -ionone. The lactones constituted 31.9-53.2% of the volatile components. Vanillin was detected in the canning syrup. [From En summ.] JA

71
[Volatile cocoa flavour compounds as indicator substances in cocoa processing.] Leichtflüchtige Kakaoaromastoffe als Leitsubstanzen bei der Kakaoverarbeitung.

Ziegler, G.
Zucker- und Süßwarenwirtschaft 34 (4) 105-109 (1981) [38 ref. De] [Fraunhofer-Inst. für Lebensmitteltech. & Verpackung, Schragenhofstrasse 35, 8000 Munich 50, Federal Republic of Germany]

Analysis of volatiles in cocoa and chocolate processing products by headspace GLC is discussed, with reference to use of selected volatile constituents as indicator substances in process control and process optimization. Effects of various stages of processing (fermentation, drying, storage, roasting, conching) on concn. of volatiles are discussed, with special reference to isopentanal; tables of data are given for changes in isopentanal, isobutanol, diacetyl, 2-methylfuran and pentan-2-one concn. in cocoa beans and nibs as a result of fermentation and roasting conditions, and isopentanal concn. in raw fermented cocoa beans from various sources, and in cocoa mass, press cake, cocoa powder, cocoa butter and chocolate mass. The potential for use of headspace volatiles data for process control is discussed in detail. AJDW

72
[Measurement of volatile carbonyl compounds in the vapour of cooked rice.]

Endo, I.; Chikubu, S.; Tani, T.
Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 24 (3) 142-144 (1977) [5 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric. & Forestry, Koto-ku, Tokyo, Japan]

Direct gas chromatography was used to determine volatile carbonyl compounds in the vapour produced by cooked rice. Compounds not previously found in such vapour were identified, namely *iso*-butyraldehyde, *n*-butyraldehyde and *iso*-valeraldehyde. Comparison of stored and fresh rice indicated that the former generally contains higher levels of carbonyl compounds, particularly of *n*-caproaldehyde. [From En summ.] JA

73
[Extraction of bacuri flavour and its use in yoghurt.] Nazare, R. F. R. de; Melo, C. F. M. de
Circular Tecnica, EMBRAPA, Centro de Pesquisa Agropecuaria do Tropico Umido No. 15, 13pp. (1981) [5 ref. Pt, en] [Centro de Pesquisa Agropecuaria do Tropico Umido, Belem, Para, Brazil]

A flavour extract was obtained from pulp of bacuri fruit (*Platonia insignis* Mart.) by dilution 1:3, treatment with 0.5% pectinol, filtration with Celite (first at 8%, then at 5%), and distillation. The extract was added at 0.2, 0.3, 0.4, 0.5 and 0.6%, with or without 20% sugar, to yoghurt made from buffaloes' milk. The yoghurt was kept for 6 days at 8-10°C before organoleptic assessment. Yoghurt with 0.5% flavour extract and 20%

sugar was judged to have the best taste and odour. It is concluded that the extract, costing NCr 0.25/100 ml yoghurt, has considerable advantages over bacuri fruit pulp as a flavouring. ADL

74
Identification and estimation of some volatile carbonyls in three types of khoa by GLC. Gyanendra Kumar; Srinivasan, M. R.
Journal of Food Science and Technology, India 18 (4) 157-158 (1981) [7 ref. En] [Dep. of Dairy Tech., S. Reg. Sta. of Nat. Dairy Res. Inst., Bangalore-560 030, India]

Steam volatile carbonyls from (i) cows' milk khoa, (ii) buffaloes' milk khoa and (iii) commercial khoa were separated and estimated by GLC. Of the 9 identified carbonyls, pentan-2-one was the major component, representing 11.67% of the steam volatile carbonyls in (i) and 7.15% in (ii) while heptan-2-one was predominant in (iii) at 42.15%. Unidentified carbonyls accounted for 68.5% in (i), 73.3% in (ii) and 34.8% in (iii). CFTRI

75
Review of the flavour-contributing volatiles and water-soluble non-volatiles in pork meat and derived products. [Review]

Gorbatov, V. M.; Lyaskovskaya, Yu. N.
Meat Science 4 (3) 209-225 (1980) [59 ref. En] [All-Union Meat Res. Inst., Moscow, USSR]

In relation to the problem of meat flavour, volatile and minor non-volatile components of raw, cooked and pre-cured cooked pork meat (carbonyls, sulphur compounds, volatile fatty acids, alcohols and other volatiles, nucleotides and their decomposition products, free fatty acids) are considered. Quantitative changes in some of the components, as effected by technological treatments such as heating, curing and curing and heating, are compared. The possibility of evaluating the quality of heated cured pork products by the hydrogen sulphide/mercaptan ratio is indicated. AS

76

New interest in CO₂ extraction of spices, 'naturals' - offers process/quality advantages.

Anon

Food Processing 41 (1) 92-93 (1980) [En]

Liquid CO₂ extraction is becoming increasingly attractive as a means of concentrating flavours and aromas from natural materials. Previously commonly used solvents such as trichlorethylene and ethylene dichloride are being supplanted because of possible health risks, but CO₂ extraction offers positive benefits in terms of the quality of the extract produced and economical running of the extraction plant.

Supercritical CO₂ has advantages over low temp. liquid CO₂, but requires more expensive equipment to cope with the pressures of 100 to 300 atm. involved. JRR

77

[Taste of mirin.] [Review]

Morita, H.; Matsuoka, S.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 75 (11) 893-897 (1980) [24 ref. Ja] [Cent. Res. Inst., Takara Sake Brewery Co. Ltd., Otsu-shi, Japan]

A review of the flavour compounds in mirin, as seasoning, is presented. YN

78

Application of large bore coated (LBC) columns to flavour analysis of beverages and confections.

Hussein, M. M.; Mackay, D. A. M.

Journal of Food Science 46 (4) 1043-1050 (1981) [6 ref. En] [Life Savers Inc., North Main Street, Port Chester, New York 10573, USA]

A large bore coated (LBC) column consisting of 25 ft x 0.186 in internal diam. Al tubing internally coated with silicone rubber can extract flavours from beverages and dissolved confections. The beverage or solution is simply poured through the column, the column is washed with water, dried with N₂ and the trapped organics transferred with heat and N₂ to a porous polymer pre-column sized to fit the tube oven attached to the injector of the gas chromatograph. A model system of peppermint oil at 2.5 p.p.m. in water showed that quantitative recovery of components in the parts/billion range was possible. Recovery factors were investigated, revealing interference from colloidal systems as in milk and beer. The LBS column method for flavours in carbonated beverages was compared with solvent extraction and N sparging methods. Results were comparable. IFT

79

Volatile N-nitrosamines in dried foods.

Sen, N. P.; Seaman, S.

Journal of the Association of Official Analytical Chemists 64 (5) 1238-1242 (1981) [8 ref. En] [Food Res. Div., Health & Welfare Canada, Ottawa, Canada K1A 0L2]

An investigation was carried out to determine the levels of volatile N-nitrosamines in several dried food commodities such as malt, instant skim milk powder, infant formula containing milk powder, instant coffee, soup and soup bases, and baby cereals. The method

involves vacuum distillation of the sample from 3N KOH or 1% sulphamic acid, followed by extraction of the aqueous distillate with dichloromethane. The dichloromethane extract is then washed with an acidic buffer (to remove amines), dried over anhydrous sulphate, concentrated in a Kuderna-Danish concentrator, and analysed by GLC, using a thermal energy analyser. Detection limit is 0.1-0.5 ng/g. Of the samples analysed thus far, all malts (22 samples) and instant skim milk powders (11 samples) were positive for N-nitrosodimethylamine (NDMA); average levels were 7.4 ng/g (1.3-67.0 ng/g) and 0.4 ng/g (0.3-0.7 ng/g) resp. Traces of NDMA and/or N-nitrosopyrrolidine were also detected in 3 of 20 dried soups and 5 of 10 instant coffees analysed. Traces of NDMA and/or N-nitrosopiperidine (NPIP) were detected in 3 of 8 powdered infant formulas. All 4 baby cereal samples were negative. The identity of NDMA in 14 samples of malt and that of NDMA and NPIP in an infant formula was confirmed by GLC-MS; identity of N-nitrosamines in 3 instant coffees and 1 infant formula was independently verified by HPLC analysis. AS

80

Novel applications for headspace gas chromatography.

Dong, M. W.

Chromatographia 14 (8) 447-451 (1981) [23 ref. En] [Celanese Res. Co., Summit, New Jersey 07901, USA]

New applications for headspace gas chromatography (HSGC) are described, including detn. of residual acetaldehyde in polyethylene terephthalate (PET) bottles which may impart off-flavours to cola beverages. An improved automated HSGC method has a sensitivity of 50 parts/billion, precision $\pm 7\%$ and sample throughput of 40/shift. Discontinuous gas extraction was used to confirm the results. RM

81

[Volatile sulphur containing compounds in beer.] [Review]

Matsui, S.; Amaha, M.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 75 (10) 801-805 (1980) [37 ref. Ja] [Cent. Res. Inst., Asahi Brewery Co. Ltd., Ohta-ku, Tokyo, Japan]

82

[Volatile sulphur containing compounds in sake.]

[Review]

Namba, Y.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 75 (10) 791-795 (1980) [16 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

83

Flavour losses in apple juice manufacture.

Peredi, K.; Vamos-Vigyazo, L.; Kiss-Kutz, N.
Nahrung 25 (6) 573-582 (1981) [6 ref. En, de, ru] [Cent. Food Res. Inst., Budapest, Hungary]

Gas chromatography and sensory analysis were used to analyse the changes in the aroma compounds of the raw material, pressed juice, clarified and filtered juice, apple juice concentrate and apple aroma concentrate during manufacture of apple juice in 2 different plants. Plant A was equipped with an Alfa-Laval installation including an aroma recovery unit, and plant B had a Hungarian installation without an aroma recovery unit. After preliminary purification and vacuum extraction of volatile compounds (aroma recovery) in plant A, the enzyme preparation Pectinex R (Rohm, Federal Republic of Germany) and various clarifying agents were applied for 8-10 h at 20-22°C. In plant B the filtered press juice was immediately treated with the enzyme preparation Phylazin (Phylaxia, Hungary) for 2 h at 55°C. The greatest aroma losses were encountered during evaporation concentration of the clarified and filtered juices in both plants. Chromatograms illustrate the distinct differences between juices from plants A and B; however, sensory evaluation showed a difference between juices produced by the 2 plants only at the end of the processing season. IN

84

2,3,5-trithiahexane in the essential oil of *Humulus lupulus*.

Moir, M.; Seaton, J. C.; Suggett, A.
Phytochemistry 19 (10) 2201 (1980) [11 ref. En]
 [Scottish & Newcastle Breweries Ltd., Holyrood Road, Edinburgh, UK]

85

The flavor contribution of sulfur compounds in hops.

Seaton, J. C.; Suggett, A.; Moir, M.
Technical Quarterly, Master Brewers' Association of the Americas 18 (1) 26-30 (1981) [19 ref. En, es]
 [Scottish & Newcastle Breweries Ltd., Edinburgh, UK]

Several new S-containing hop oil components are reported. These include methyl and methylthiomethyl thioesters, 3-alkylthiophenes and terpenoid methyl sulphides. Flavour thresholds in beer are given for some of these compounds as well as descriptions of the flavour they impart to beer. Hops which contain free residual S as a result of excessive or late fungicidal spraying or through sublimation during sulphuring in the kiln are unsuitable for flavour hopping, although the compounds responsible for the sulphury, rubbery off-flavours have not been identified. Conversely the use of hops which possess high levels of thioesters for late-hopping of lagers or dry-hopping of ales gives rise to cheesy and cabbagey off-flavours which can be avoided if the hop oils are monitored by gas chromatography with flame photometric detection. [See FSTA (1982) 14 4H540.] AS

86

Aroma recovery and sulfur dioxide preservation of orange juice.

Perez, R.; Gasque, F.; Izquierdo, L. J.; Lafuente, B.
Confructa 25 (3/4) 132-140 (1980) [18 ref. En] [Inst. de Agroquímica & Tecnología de Alimentos, Valencia, Spain]

As SO₂ used as a fruit-juice preservative imparts an undesirable flavour, and as aroma components are lost during desulphitation by steam-stripping, a new process, already applied successfully to Spanish grape juice, has been developed, which improves the quality of reconstituted juice by removing the volatile fraction from fresh juice before sulphitation and storage (at -18°C), and subsequently reincorporating the aroma components after desulphitation. Juices from Valencia, Verna and Comuna oranges were stripped of aroma compounds, pasteurized, conc. to 65°Brix, and preserved with 1800 p.p.m. SO₂. Recovered aroma fractions were separately stored at -18°C. The juices were periodically reconstituted, desulphitation being carried out by a HTST process, and analysed sensorily (18-member panel, using 9-point scale), by GLC, for colour (Hunterlab model D-25), and for ascorbic acid (visual dye titration method). Min. residual SO₂ (97.4% eliminated) was obtained by pre-heating juice to 130°C, holding for 2 s, and flash-evaporating under vacuum (30°C) thrice. Quality of juice thus treated was adjudged perfectly acceptable after 3 months storage, although there was some fading of colour; ascorbic acid content had slightly decreased (351 vs. 385 mg/dm³ initially). After 12 months, juice was still sensorily satisfactory, but >50% ascorbic acid had been lost. A sample stored for 4 months, reconstituted and re-stored for 1 month (at 0-2°C), was considered just as acceptable as frozen conc. "cut-back" (43°Brix) juice. KME

87

The relationship between vinification procedures and the volatile components of the wine 'Pinot Bianco Trentino 79'.

Margheri, G.; Versini, G.; Sartori, G.; Inama, S.; Pellegrini, R.; Gianotti, L.
Vini d'Italia 22 (129) 275-282 (1980) [16 ref. En, It, fr, de] [Istituto Agrario Provinciale, San Michele all'Adige Trento, Italy]

Influence of different vinification procedures on volatile content of wine, and relation of objective measurements of composition to wine quality were studied on 1 batch of Pinot Bianco Trentino grapes. 20 000 kg of grapes were pressed using a programmed horizontal press to give 3 musts (i) from a pressure up to 1.5 kg/cm² (130 hl), (ii) 1.5-4.2 kg/cm² (14 hl) and (iii) 4.2-8 kg/cm² (6 hl). (i) must was clarified by sedimentation and fining with SO₂ + bentonite + gelatin and the sediment was added to (ii) giving final must vol. of (i) 116 hl and (ii) 28 hl. (iii) must was also acidified and clarified by adding SO₂, bentonite and potassium caseinate. (i) was fermented with a pure culture of *Saccharomyces ellipsoideus*; (ii) and (iii) musts were allowed to ferment spontaneously. Detailed chemical compositions of the 3 wines are tabulated, as are contents of volatile esters, fatty acids, higher

alcohols and terpenic alcohols as determined by glass capillary gas chromatography. Total contents of 9 esters contributing to fruit flavour of wine were, for (i)-(iii) 10, 5.1 and 2.2 mg/l, resp.; corresponding contents of fatty acids were C6 + C8 + C10 7.6, 5.2, 3.5 mg/l, C4 + C5 1.6, 2.4, 2.15, showing that (i) wine had the composition most favourable for flavour. Similar results were obtained for higher alcohols, total contents in (i)-(iii) being 225, 266.2, 283.9 mg/l, resp., and 3-methylthio-1-propanol: 11, 23.5 and 26.0 µg/l. Contents of C6 alcohols and terpenic alcohols were in general higher in (ii) and (iii) than in (i). DIH

88

[Recovery of coffee aroma during roasting.

I. Trapping emitted gases by condensation and absorption.]

Shin, H. K.; Crouzet, J.

Cafe-Cacao-The 25 (2) 127-136 (1981) [21 ref. Fr, en, de, es] [USTL, 34060 Montpellier Cedex, France]

The recovery of coffee aroma compounds formed during roasting, from the gases leaving a fluidized bed roasting apparatus with gas recycling, was investigated. Preliminary fractionation tests showed that the most important aroma compounds accounted for the greatest wt. % and were most easily condensed. As a result, the volatile constituents in the roasting gases were trapped by condensation and absorption with an instrumental arrangement simulating a continuous roasting operation. About 70% of the volatiles in the smoke (expressed as total organic C) were trapped by water condensation with the aid of a tubular exchanger, the yield depending on gas flow rate. About 50% of compounds from the condenser was trapped by a tower packed with Raschig rings: the yield was dependent on the height of packing and on the liquid and gas flow rates, and did not decrease when the absorbent was recycled for 20 successive operations. AS

89

Characterization of additional volatile flavor components of apricot.

Chairote, G.; Rodriguez, F.; Crouzet, J.

Journal of Food Science 46 (6) 1898-1901, 1906 (1981) [En] [Lab. de Biochimie Appliquee, Univ. des Sci. & Tech. du Languedoc, 34060 Montpellier Cedex, France]

The volatile components of apricot var. "Rouge du Roussillon" were isolated by vacuum distillation and fractionated on silica gel. Analysis by combined gas chromatography-MS led to identification of several compounds identified for the first time from this product. These compounds included *p*-hydroxybenzaldehyde, *p*-methoxybenzaldehyde, (3-phenyl propyl)-propyl or isopropyl ketone, 3-nonene-2-one, damascenone, β -ionone, dihydroactinidiolide, 2-phenylethanol, cis rose oxide and nerol oxide. The formation mechanism of these compounds is envisaged. Fractions isolated by chromatography on silica gel and head space conen. on Chromosorb 105 were sniffed and analysed by gas chromatography. The results obtained indicate that aroma of apricot is due to the presence of compounds such as benzaldehyde, linalool, 4-terpinenol, α -terpineol and perhaps 2-phenylethanol which are responsible for the floral and fruity part of the aroma. Lactones previously identified are "background" compounds as in Ching peach. IFT

90

[Studies on biosynthesis of esters in fruit volatiles. Coenzyme A-dependent esterification of alcohols and acids in separated cells of banana pulp and homogenate.]

Ueda, Y.; Ogata, K.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 11 (12) 624-630 (1977) [7 ref. Ja, en] [Lab. of Processing & Physiol. of Hort. Products, Univ. of Osaka Prefecture, Sakai, Osaka 591, Japan]

Attempts were made to ascertain whether volatile ester formation in banana fruit is a reversed esterase reaction or a coenzyme-dependent reaction. Extensive studies with banana slices, pulp, homogenates, vacuole tissue and mesocarp cells indicated that acyl coenzyme A is the intermediate in ester formation. [From En summ.] JA

91

Effect of chilling on respiration and volatiles of California lemon fruit.

Eaks, I. L.

Journal of the American Society for Horticultural Science 105 (6) 865-869 (1980) [12 ref. En] [Dep. of Biochem., Univ. of California, Riverside, California 92521, USA]

The respiration, ethylene production and ethylene, ethyl alcohol, and acetaldehyde content of the internal atmosphere of citrus fruit increased at 20°C following exposures to chilling temp. (0° and 5°) compared with fruit placed directly at 20°C. The increases were greater the longer the exposure and greater following exposure to 0° than following exposure to 5°. Exposure to 12.8°, a nonchilling temp., did not elicit a stimulation of these attributes when transferred to 20°. Ethylene, ethyl alcohol, and acetaldehyde in the internal atmosphere of fruit remained at the same levels during the chilling exposures. During storage at 12.8° the acetaldehyde content in the internal atmosphere increased, but the ethylene and ethyl alcohol content did not. The chilling injury sustained by citrus fruit during storage could be evaluated by transferring samples to 20° and determining the respiratory rate, ethylene production and the volatile content in the internal atmosphere 24 h after transfer to 20°C. AS

92

Identification of new volatile amines in grapes and wines.

Ough, C. S.; Daudt, C. E.; Crowell, E. A.

Journal of Agricultural and Food Chemistry 29 (5) 938-941 (1981) [16 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

A number of amines were identified for the first time in grapes. These include methylamine, dimethylamine, ethylamine, diethylamine, *n*-propylamine, isobutylamine, α -amylamine, isoamylamine, pyrrolidine, and 2-phenethylamine. The trifluoroacetamides of the isolated amines were separated on Carbowax 20M or SE-54 fused silica capillary columns and identified by retention times and mass spectra. 2 amines, diethyl and α -amyl, were identified in wine for the first time. Mass spectra of the pure trifluoroacetic anhydride derivatives of these amines are given. AS

93

Volatile constituents and fatty acid composition of lipids in *Durio zibethinus*.

Moser, R.; Düvel, D.; Greve, R.

Phytochemistry 19 (1) 79–81 (1980) [23 ref. En]

NATEC, Inst. für Naturwissenschaftlich-Tech. Dienste GmbH, Behringstrasse 154, 2000 Hamburg 50, Federal Republic of Germany]

The predominating flavour compounds in the fruit pulp of *Durio zibethinus* were hydrogen sulphide, ethyl hydrodisulphide and several dialkyl polysulphides, particularly $(C_2H_5)_2S_n$, where $n = 2$ or 3. Ethyl acetate, 1,1-diethoxyethane and ethyl 2-methylbutanoate contribute to an additional fruity odour note.

Hydrodisulphides are probably the precursors of the dialkyl sulphides. In the pericarp and seed no volatile S compounds could be detected. The fatty acid composition of the lipids in pericarp, pulp and seed depended on the origin and/or harvest season of the fruit. The main components were oleic and palmitic acids or arachidic acid together with appreciable quantities of palmitoleic, stearic, linoleic and linolenic acids. AS

94

Gas chromatography-mass spectroscopy investigations on the flavour chemistry of oat groats.

Heydanek, M. G.; McGorin, R. J.

Journal of Agricultural and Food Chemistry 29 (5)

950–954 (1981) [14 ref. En] [John Stuart Res. Lab.,

Quaker Oats Co., Barrington, Illinois 60010, USA]

Dried oat groat volatiles were characterized by GLC-MS in an effort to study the inherent flavour chemicals in oats before processing. Volatile isolation by vacuum distillation and Tenax headspace trapping, both before and after hydration, resulted in compositionally different isolates. Dry vacuum distillates primarily contained $C_{10}H_{16}$ monoterpenes, alkylbenzenes, and hexanal. Vacuum steam distillation resulted in large increases of volatiles presumed to originate via residual enzyme activity on oat lipids. Major amounts of C_4 – C_6 alcohols, hexanal, 1-octen-3-ol, nonanal, and (*E,E*)- and (*Z,E*)-3,5-octadien-2-one were found in the hydrated groat isolates. Headspace isolation, dry and hydrated, also exhibited this difference. Oat groats do not appear to contain large amounts of inherent flavour components but depend on further processing for oat flavour development. AS

95

Gas chromatography-mass spectroscopy identification of volatiles from rancid oat groats.

Heydanek, M. G.; McGorin, R. J.

Journal of Agricultural and Food Chemistry 29 (5)

1093–1095 (1981) [7 ref. En] [John Stuart Res. Lab.,

Quaker Oats Co., Barrington, Illinois 60010, USA]

A systematic GLC-MS study of the volatiles present in oxidatively rancid oat groats is presented. Autooxidation compounds expected from the fatty acid composition of oats (high linoleic content) were observed. The most abundant volatiles found were hexanal, pentanal, 1-pentanol, and 3,5-octadien-2-one. A total of 45 compounds were identified, including 24 aldehydes, ketones, and alcohols probably arising from lipid autooxidation. AS

96

[Volatile compounds obtained from thermal oxidation of fats.]

Vila, J.; Casanovas, A.; Celades, R.

Revue Francaise des Corps Gras 28 (6) 251–255 (1981)

[35 ref. Fr, en, de, es] [Hispano Quimica SA, Barcelona, Spain]

Volatile compounds from the thermal oxidation of plant and fish oils obtained by bubbling small air bubbles through at 130°C, were condensed in a cold trap and studied by GLC-MS. Results, shown graphically and in tables, reveal the following composition of volatiles: from oxidized olive-foot oil – 31% ethanol, 13% acrolein, 5% butanol, 14% heptane, 11% pentanol, 9% octane, 13% hexanal, 3% nonene and 1% decene; from oxidized sardine oil – 91% acrolein, 1% butanal, 1.5% heptane, 1% each of ethyl furane, octane and nonane, 0.5% each of decane, butyl furane, pentyl furane, and undecane and 1.5% pentenyl furane. RM

97

[Application of GLC head-space technique to the olive oil 'atrojado' problem. I.]

Barrio Perez-Cerezal, A. del; Gutierrez Rosales, F.;

Gutierrez Gonzalez-Quijano, R.

Grasas y Aceites 32 (3) 155–161 (1981) [11 ref. Es, en, fr] [Inst. de la Grasa y sus Derivados, Apartado 1078, Seville 12, Spain]

Sensory and GLC analysis were used to study the relation between octane concn. in the headspace of olive oil containers and their stored ('atrojado') odour and flavour. Tabulated results showed the existence of an inverse relation: in 6 oil samples the octane peak area (retention time 470 s) in the headspace increased as sensory evaluation fell. During 100 days storage, sensory quality fell and headspace octane peak area rose with time. Peak area and sensory evaluation were highly correlated, with $r = 0.99$. [See also FSTA (1977) 9 10N491.] RM

98

[Effect of sodium caseinate on consistency of smetana.]

Ramanauskas, R.; Urbene[Urbene]. S.

Trudy, Litovskii Filial Vsesoyuznogo Nauchno-issledovatel'skogo Instituta Maslodol'noi

Syrodol'noi Promyshlennosti 11, 96–99, 153 (1977)

[2 ref. Ru, li, en] [Litovskii Filial VNIIMSP, Kaunas, USSR]

Dried skim milk or sodium caseinate were added at 2% to cream in manufacture of smetana with 20% fat, and viscosity characteristics were measured after preparation and after ripening in comparison with control smetana and smetana with 30% fat. Addition of dried skim milk increased the viscosity characteristics to approx. those of 30% fat smetana, but sodium caseinate was much more effective than dried skim milk. In further tests with sodium caseinate added to cream at 0, 1.0, 1.8 or 2.0%, pH, titratable acidity, formation of volatile fatty acids and viscosity characteristics were measured after preparation, after ripening, and after holding at 8°C for 72 h in comparison with corresponding values for 30% fat smetana. Optimal sodium caseinate addition was 1.8–2.0%, which intensified volatile fatty acid formation and led to marked increase in firmness during ripening and storage; 20% fat smetana so produced had viscosity characteristics substantially higher than those of 30% fat smetana. SKK

99

The flavour of milk fat. (In 'Proceedings of milk fat symposium' [see FSTA (1982) 14 4P514]) [Lecture] Urbach, G.

pp. 18-28 (1979) [52 ref. En] [CSIRO Food Res. Div., Dairy Res. Lab., Highett, Victoria 3190, Australia]

Results of > 20 yr research into the chemistry of milk fat flavour are discussed. The important fatty acids for flavour are γ - and δ -hydroxyacids and possibly δ - and γ -ketoacids, β -ketoacids, lower fatty acids up to C12, and some unsaturated acids. During its biosynthesis, milk fat is in contact with the other milk constituents from which it can absorb flavours. It is more saturated than nearly all vegetable oils and is therefore much less subject to oxidative deterioration. DMK

100

[Characterization of cheeses by the lipid fraction. Free volatile fatty acids.]

Ceccon, L.; Stancher, B.; Calzolari, C.

Rivista Italiana delle Sostanze Grasse 58 (3) 132-138 (1981) [44 ref. It, en] [Istituto di Merceologia, Univ., Trieste, Italy]

A method is described for the estimation of C2-C6 free volatile fatty acids (FVFA) in cheese, using a typical Italian cheese, Asiago. FVFA are recovered from the sample by steam distillation and the recovery checked by plotting % recovery for each acid vs. vol. of distillate collected. The FVFA are titrated with NaOH, Na salts evaporated to dryness, converted into methyl esters in a sealed vial, to prevent losses of the more volatile compounds, and analysed by GLC with flame ionization detection, using cyclopropane carboxylic acid as internal standard. AS

101

[A simple quantitative method for determination of pungent components in the hydrolysate from *Wasabia japonica* by head-space gas chromatography.]

Kojima, M.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 24 (2) 90-93 (1977) [5 ref. Ja, en] [Fac. Pharmaceutical Sci., Fukuoka Univ., Nanakuma, Nishi-ku, Fukuoka-ken, Japan]

Pungent components were determined in 8 groups of *W. japonica* [Wasabi, *Eutrema japonica*], (e.g. Mazuma, Sanpo, Shimane No. 3) by head-space gas chromatography. The results obtained were compared to those obtained by other techniques. It is concluded that the head-space technique is applicable as a simple quantitative method for determining allyl isothiocyanate and other pungent compounds in wasabi. [From En summ.] JA

102

Volatile constituents of Spanish *origanum* (*Coridothymus capitatus*) essential oil.

Sandra, J. M.; Cunat, P.

Phytochemistry 19 (1) 89-92 (1980) [11 ref. En] [Inst. de Agroquímica y Tecnología de Alimentos (CSIC), Jaime Roig, 11 Valencia-10, Spain]

Analysis of the neutral fraction of *Coridothymus capitatus* essential oil (Spanish *origanum* oil) revealed 61 components. Of the new components reported there were 25 monoterpenes, 9 sesquiterpenes, 5 aliphatic, 1 phenol and 1 phenyl ether. AS

103

The essential oil of ginger from Fiji.

Smith, R. M.; Robinson, J. M.

Phytochemistry 20 (2) 203-206 (1981) [20 ref. En] [Dep. of Chem., Univ. of Tech., Loughborough, Leics., LE11 3TU, UK]

The essential oil of ginger (*Zingiber officinale*) from Fiji was analysed by gas chromatography-MS and a number of sesquiterpenes not reported previously in ginger oil were identified including α -copaene, β -bourbonene, α -bergamotene, α -selinene, calamenene and cuparene. The composition of the oil was unusual in having a much higher neral and geranial content than oils reported from India, Australia, Japan and Africa. AS

104

Investigations into flavouring compounds formed in roasted brown mustard (*Brassica juncea* Linn.).

Vasundhara, T. S.; Parihar, D. B.; Vijayaraghavan, P. K. *Nahrung* 25 (7) 685-692 (1981) [13 ref. En, de, ru] [Defence Food Res. Lab., Mysore-10, India]

Roasted brown mustard seeds (*Brassica juncea*) are an important condiment. The flavour of unroasted mustard seed powder is mainly due to isothiocyanates, but roasting alters the flavour. 24 compounds responsible for flavour were identified in roasted mustard, i.e. 9 carbonyls, 6 pyrazines, 2 thiophenes, 2 amines, 1 nitrile, 2 isothiocyanates, 1 thiocyanate and 1 alkyl sulphide. The carbonyls were resolved (by TLC) as 2,4-DNP-hydrazone. Total carbonyls were 105 mg/5 kg in roasted and 26 mg/5 kg in unroasted mustard. Non-carbonyls were separated by GLC (characterization by their specific retention times on different columns) and by TLC (characterization by their R_f and specific colour reactions). Results were confirmed by their IR spectra. Quantitative detn. and mechanisms of formation of the flavour compounds are discussed. IN

105

[New methods for evaluation and analysis of organoleptic qualities of foodstuffs and prediction of their changes. XV. The dependence of aroma intensity on sorption of flavour substances on protein.] Neue Methoden der Be- und Auswertung sensorischer Eigenschaften von Lebensmitteln und der Berechnung ihrer Veränderungen. XV. Abhängigkeit der Aromaintensität von der Sorption der Flavourstoffe an Eiweiss.

Herrmann, J.; Kiener, W.

Nahrung 25 (7) 693-700 (1981) [24 ref. De, en, ru]

[Sektion Nahrungsgüterwirtschaft & Lebensmitteltech., Humboldt-Univ., Berlin]

The intensity of sensory perception of hexanal was studied by a trained panel, and its relationship to concn. was evaluated mathematically. Application of subjective olfactometry to evaluation of binding of aroma compounds (hexanal, diacetyl or the bovine blood plasma off-flavour factor) to proteins (egg albumen, gelatin) was studied. Appreciable sorption of aroma compounds may occur even in solutions containing only 2% protein. At 22°C and pH 7, interactions of aroma substances with proteins were weak and non-specific. [See FSTA (1981) 13 11A744 for part XIV.] IN

106

[Retention of volatile flavours in carbohydrates during food dehydration.]
Sugisawa, H.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 24 (2) 94-103 (1977) [40 ref. Ja] [Dep. of Food Sci., Kagawa Univ., Miki-cho, Kagawa-ken, 761-07, Japan]

107

Influence of dryer infeed matrices on the retention of volatile flavor compounds during spray drying.
Bangs, W. E.; Reineccius, G. A.

Journal of Food Science 47 (1) 254-259 (1982) [En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, 1334 Eckles Avenue, St. Paul, Minnesota 55108, USA]

Retention of volatile flavour compounds (octane, 2-octanone, octanal, methyl-2-octenoate, oct-1-en-3-ol, octanol, thiophene, 2-ethylthiophene, thiazole, 2,5-dimethylpyrazine, benzaldehyde, 5-methylfurfural) in model food systems during spray-drying was studied. The flavour compounds were added to different model food systems (including maltodextrins DE 10-36.5, soy, casein and whey protein based systems and protein/fat systems) at 1 p.p.m. and then spray-dried by centrifugal atomization. Flavour retention was found to be inversely related to DE of the maltrin carrier. Inclusion of protein in the infeed material resulted in better flavour retention than pure maltrin infeeds. Soy protein based model systems were most effective in retaining flavours followed by casein and whey protein based systems. Relative volatility of flavour compounds in different model systems was found to be an important factor pertaining to flavour retention during drying in different infeed materials. IFT

108

Health risks from volatile halogenated hydrocarbons.
Lahl, U.; Cetinkaya, M.; Düszen, J. V.; Stachel, B.; Thiemann, W.

Science of the Total Environment 20 (2) 171-189 (1981) [62 ref. En] [Dep. of Biol./Chem., Univ. of Bremen, Leobener Strasse, D-2800 Bremen 33, Federal Republic of Germany]

On the basis of concn. of volatile halogenated hydrocarbons (VHH) in drinking water, food and air (tables given), the average daily VHH intake is estimated. VHH in food was generally at low levels (50 samples of basic foods were analysed) the largest concn. found being of tetrachloroethane. Drinking water and other beverages (milk, beer, lemonade, coffee, tea), were also analysed and highest concn. were of trichloromethane. Special environmental burdens causing greater intake are also considered. LH

109

Isolation and identification of objectionable volatile flavor compounds in defatted soybean flour.

Hsieh, O. A.-L.; Huang, A.-S.; Chang, S. S.

Journal of Food Science 47 (1) 16-18, 23 (1982) [En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

The volatile flavour constituents of defatted soy flour were isolated by a specially designed apparatus. The isolated volatiles were fractionated by gas chromatography. The fractions with characteristic beany, grassy, and green odours were identified by IR and MS. A total of 25 compounds was identified, including 9 alcohols, 6 aldehydes, 9 ketones, and 2-pentyl furan. Among the identified compounds, 2-pentyl furan and ethyl vinyl ketone were probably the key compounds for the beany and grassy odours of the soy flour. All the compounds identified in this study can be postulated as autoxidative decomposition products of soy lipids. Therefore, the presence of these compounds in soy flour might be due to the incomplete removal of lipids in soy flour. IFT

110

[Gas chromatographic determination of volatile constituents in extract-containing spirits. Behaviour of volatiles during distillation.]

Gaschromatographische Bestimmung der flüchtigen Inhaltsstoffe in extrakthaltigen Spirituosen. Verhalten der flüchtigen Stoffe bei der destillativen Abtrennung.
Postel, W.; Adam, L.

Branntweinwirtschaft 121 (9) 146-152 (1981) [24 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Studies were conducted, using model solutions, to determine effects of alcohol concn. (10, 20 or 40 vol.%), volatiles concn. and duration of distillation (30-90 min) on distillation characteristics of 21 volatile compounds (aldehydes, methanol, higher alcohols and esters). Tables and graphs of results are given. The results show that ethanol concn. has a considerable effect on distillation characteristics of the volatiles, and the distillate fraction into which they pass. Response to differing ethanol concn. differed between the various volatiles studied. A distillation time of 45 min was sufficient to achieve 100% recovery in the distillate of all the compounds studied except 2-phenylethanol and ethyl lactate; 30 min gave appreciably lower recoveries of some compounds. Concn. of individual volatiles in the model solution had little effect on their distillation characteristics. These results are discussed in relation to distillative separation of volatiles from spirits before gas chromatographic analysis. AJDW

111

[Flavour of shochu.] [Review]

Nishiya, T.

Journal of the Society of Brewing, Japan [*Nihon Jozo Kyokai Zasshi*] 75 (12) 944-952 (1980) [33 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

The flavour of shochu in relation to manufacturing method, physical and chemical properties, and mineral content, as well as the classification of shochu by flavour components are reviewed. YN

112

Changes in volatile sulfur compounds of whisky during aging.

Masuda, M.; Nishimura, K.

Journal of Food Science 47 (1) 101-105 (1982) [En] [Cent. Res. Inst. of Suntory Ltd., Wakayamadai-1, Shimamoto-Cho, Mishima-Gun, Osaka, Japan]

Volatile S compounds of malt whiskies were analysed using a gas chromatograph equipped with a flame photometric detector by direct injection and solvent extraction methods. S compounds identified by coupled gas chromatography-MS and by matching gas chromatographic retention times were dimethyl sulphide, dimethyl disulphide, dimethyl trisulphide, 3-(methylthio)propanal, 3-(methylthio)propanol, 3-(methylthio)propyl acetate, ethyl 3-(methylthio)propanoate, dihydro-2-methyl-3(2H)-thiophenone, 2-thiophene-carboxaldehyde, 5-methyl-2-thiophenecarboxaldehyde, benz othiophene and benzothiazole. Quantitative changes in these volatile S compounds were studied by analysing 48 aged and unaged malt whiskies by these methods. Dimethyl sulphide, 3-(methylthio)propyl acetate, dihydro-2-methyl-3(2H)-thiophenone and ethyl 3-(methylthio)propanoate decreased rapidly during ageing and disappeared within 3 yr. Dimethyl disulphide decreased gradually during ageing. Dimethyl disulphide proved to be formed during distillation by the action of Cu. IFT

113

[Industrial concentration and aroma isolation in liquid foods.] Industrielle Konzentrierung und Aromagewinnung von flüssigen Lebensmitteln. [Book] Pala, M.; Bielig, H. J.

Fortschritte in der Lebensmittelwissenschaft No. 5, xiii + 386pp. ISBN 3-7983-0205-7 (1978) [many ref. De] Berlin; Universitätsbibliothek der Technischen

Universität [Inst. für Lebensmitteltech. Frucht- & Gemüsetech., Tech. Univ. Berlin, Königin-Luise-Str. 22, 1000 Berlin 33]

This book, the fifth in the series 'Fortschritte in der Lebensmittelwissenschaft' covers aspects relating to concentration and aroma isolation in liquid foods, e.g. fruit and vegetable juices. Chapters include: Components of liquid foods of vegetable origin (pp. 5-16); Preservation of foods (pp. 17-20); Technology for fruit juice concentrates [covering concn. with aroma isolation, the cut-back method and the serum concn. method] (pp. 21-35); Physical properties [covering mechanical, thermal, diffusion and diffusion-related properties] (pp. 36-66); Evaporators for concentrating

liquid foods [covering the evaporation process, construction of evaporators, continuous single- or multi-stage evaporation installations, problems of concn. in evaporators, and criteria for selecting the evaporator] (pp. 67-102); Studies on heat transport during concentration of fruit juices in a falling film evaporator [covering hydrodynamics of liquid films, evaporation of liquid films, concn. of liquid foods in evaporators, experimental installations and experimental work] (pp. 103-127); Application of new equations to calculate heat transfer during concentration of saturated steam (pp. 128-134); Parameters affecting the effective temp. difference [covering pressure loss in a falling film evaporator and increasing the b.p. by concn.] (pp. 135-140); Measuring methods and calculation principles [covering heat flow density, calculation of effective temp. difference, heat transfer coefficients, and evaporation rate] (pp. 141-148); Experimental results from the concentration of fruit juices in a falling film evaporator [including heat transfer, evaporation rate and discussion of results] (pp. 149-187); Freeze concentration [including crystallization process in freeze concn., production of an ice-concentrate mixture and separation of the mixture] (pp. 188-231); Membrane concentration methods [including the principles and application of reverse osmosis, membranes and their structure, and effect of factory conditions] (pp. 232-265); Aroma compounds in fruit and vegetable juices [including chemistry of aroma formation and aroma changes during manufacture and storage] (pp. 266-291); Aroma isolation in food technology [covering aroma isolation process, principles of rectification and aroma isolation of fruit juices] (pp. 292-321); and Kinetic reaction viewpoint of the concentration process (pp. 322-339). RAW

114

Influence of maturity, storage and heating on the flavor of mushroom (*Agaricus bisporus*) caps and stems.

Maga, J. A.

Journal of Food Processing and Preservation 5 (2) 95-101 (1981) [13 ref. En] [Colorado State Univ., Dep. of Food Sci. & Nutr., Fort Collins, Colorado 80523, USA]

Sensory data indicated that raw caps (*Agaricus bisporus*) had a higher degree of desirable mushroom aroma than raw stems, however, cooked caps and stems were judged to be the same in aroma. Medium sized mushrooms were generally found to have more desirable aroma than small or large mushrooms. Storage for up to 7 days was detrimental to raw and cooked cap and stem aromas. Gas chromatographic analysis revealed that the level of 1-octen-3-ol and 1-octen-3-one increased with maturity, storage and cooking, with higher levels of both found in the caps as compared to the stems. Correlation of sensory and analytical data indicate that 1-octen-3-ol is associated with desirable mushroom aroma whereas 1-octen-3-one is not. Information of this type should be useful in the harvesting and distribution of mushrooms. AS

115

Volatile components of roasted pistachio-nut.

Soliman, M. M. A.; Osman, F.; El-Sawy, A. A. *Agricultural and Biological Chemistry* 45 (9) 2123-2125 (1981) [6 ref. En] [Lab. of Fats & Oils, Nat. Res. Cent., Dokki, Cairo, Egypt]

Pistachio nuts were roasted at 200-220°C for 20-30 min, finely ground, and extracted with acetone to yield 150 g oil from 515 g ground roasted nut. Aroma volatiles were isolated from the acetone extract by vacuum CO₂ distillation; yield of aroma concentrate was, from 100 g acetone extract, 0.546 g (concentrate had powerful roasted pistachio nut aroma). 0.500 g aroma concentrate was divided into basic (0.293 g) and neutral/acidic fractions, and composition was studied by gas chromatography. Identity was confirmed by MS and retention times of authentic compounds. The basic fraction had a strong nutty flavour; 6 compounds were identified, of which 2,5-dimethylpyrazine was by far the major constituent (93% of total peak area), other components being other pyrazines and pyrroles. The

neutral/acidic fraction had a sweet roast flavour; 11 components were identified, being chiefly 2-furfural, 2-hexenal, ethanol, other aldehydes, and furfuryl alcohol and acetic acid. DIH

116

[Mass spectrometry of aroma compounds in fish preserves.]

Lapshina, L. I.; Dulan, L. A.; Mokhnachev, I. G.; Kas'yanov, G. I.

Izvestiya Vysshikh Uchebnykh Zavedenii, Pishchevaya Tekhnologiya No. 2, 10-13 (1981) [4 ref. Ru] [Moskovskii Ordena Trudovogo Krasnogo Znameni Inst. Narodnogo Khozyaistva im. G. V. Plekhanova, Moscow, USSR]

The composition of aroma compounds in the volatile phase present in canned fish and distillable by steam (phenols, acids, carbonyl compounds, bases) was studied by MS. Investigation was carried out with canned smoked fish in oil for the preparation of which the smoking fluid Minch was used. Careful investigation of results showed that the specific aroma of smoked canned fish is formed by 11 phenolic compounds, 10 acids, 3 amines and 5 carbonyl compounds. STI

117

Instrumental analysis of seafood composition.

Rayner, E. T.; Dupuy, H. P.; Legendre, M. G.; Grodner, R. M.; Cook, J. A.; Novak, A. F.; Toloday, D. J. *Journal of Food Science* 47 (1) 76-78 (1982) [En] [USDA-SEA, S. Reg. Res. Cent., PO Box 19687, New Orleans, Louisiana 70179, USA]

Seafood products such a fish, crabs, shrimp and the aqueous solution from oysters, were analysed for volatiles content by direct gas chromatography and MS. Compounds were detected and identified which appear to be associated with freshness quality of the products. The data obtained suggest that the changing composition attending storage of seafood products can be effectively and rapidly analysed by objective instrumental means. IFT

118

[Evaluation of food flavour quality by means of aroma indices. I. Importance and solutions.]

Kennwerte zur Beurteilung der Aromastoffe von Lebensmitteln. I. Bedeutung und Lösungswege.

Rothe, M.; Specht, M.; Erhardt, V.

Nahrung 25 (6) 495-506 (1981) [15 ref. De, en, ru]

[Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

The complexity of food flavours is a factor limiting simple instrumental evaluation of flavour quality or flavour characteristics. A procedure for selection of instrumentally-determined flavour data which are closely related to flavour quality is described, based on correlation-, cluster- and discriminant analysis. An example of application of the procedure to meat-like flavour concentrates prepared by heating of sugar/amino acid mixtures is presented. IN

119

[Testing methods for wines. Determination of volatile acids.]

Czechoslovakia, Urad pro Normalizaci a Mereni

Czechoslovak Standard CSN 56 0216, Pt. 6, 9pp.

(1981) [Cs] [Vydavatelství Úradu pro Normalizaci a Mereni, Prague, Czechoslovakia]

In this standard, which supersedes sections 34 and 36 of the 1963 version, and came into force on Jan. 1 1982, the volatile acids (aliphatic monocarboxylic acids) are determined in wines after distillation. After removal of CO₂, the volatile acids are separated from samples acidified with tartaric acid by steam distillation and rectification of vapours. STI

120

Liquid fruit and vegetable products - Determination of sulphur dioxide content (routine method.)

International Organization for Standardization

International Standard ISO 5523-1981, 3pp. (1981)

[En]

For detn. of free SO₂, the method involves direct iodometric titration of the product at pH 0.7-1.0, followed by a blank titration of the same product, freed from SO₂ by boiling under reflux or by binding its free SO₂ with an excess of acetaldehyde or propionaldehyde. For detn. of bound SO₂ after titration of the free SO₂, the product is made alkaline and the SO₂ liberated by this hydrolysis is titrated with iodine in an acid medium. A 2nd iodometric titration after a 2nd alkali hydrolysis permits titration of the SO₂ which may have recombined, after the first hydrolysis, with any acetaldehyde present in the product. AL

121

Sweetness and bitterness of some aliphatic α,ω -glycol D-glucopyranosides.

Goodwin, J. C.; Hodge, J. E.

Journal of Agricultural and Food Chemistry 29 (5)

935-938 (1981) [21 ref. En] [N. Reg. Res. Cent., USDA, Peoria, Illinois, 61604, USA]

Mono- and di-O- β -D-glucopyranosides containing a hydrophobic aglycon consisting of aliphatic α,ω -glycols of the 3C, 4C, 6C, and 8C series were prepared and tasted. 2-Hydroxyethyl mono-O- α - and - β -D-glucopyranosides and allyl mono-O- α -D-glucoside were

definitely sweet; however, 2-hydroxyethyl mono- $O\beta$ -D- and allyl mono- $O\alpha$ -D-glucosides gave a bitter aftertaste. The hydroxyalkyl mono- $O\beta$ -D-glucosides with extended alkylene chains and allyl mono- $O\beta$ -D-glucopyranoside were bitter with no sweetness. The crystalline di- $O\beta$ -D-glucosides with extended alkylene chains (4C, 6C, and 8C) and the noncrystalline 3-hydroxypropyl mono- $O\beta$ -D-glucoside were water soluble but tasteless. 1,4-Anhydroerythritol mono- $O\beta$ -D-glucoside was bitter and not sweet. AS

122

Mixed phases of Superox 20M and OV-1 in fused silica and glass capillary gas chromatography.

Sandra, P.; Roelenbosch, M. van

Chromatographia 14 (6) 345-350 (1981) [21 ref. En]

[Lab. of Organic Chem., State Univ. of Ghent, Krijgslaan, 271 (S. 4), B-9000 Ghent, Belgium]

Mixed phases of Superox 20M and OV-1 can be coated homogeneously on the untreated wall of fused

silica capillary columns. Excellent columns with regard to efficiency, inertness and thermal stability can be obtained. The polarity and selectivity were ascertained with Rohrschneider-Reynolds probes and a capillary polarity test mixture. The analysis of an essential oil mixture (hop essential oil) illustrates the possibilities of mixed phases in practical capillary GC. AS

123

[Studies of miso aroma. IV. Role of miso components in volatile carbonyl production during heating.]

Iwabuchi, S.; Sato, M.; Shibasaki, K.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 24 (2) 65-71 (1977) [14 ref. Ja, en] [Dep. of Food Chem., Tohoku Univ., Amamiya-machi, Tsutsumidori, Sendai, Miyagi-ken, Japan]

The adsorbed fraction (AF) and non-adsorbed fraction (NAF) were isolated from Sendai-miso extract by ultrafiltration and ion-exchange; in addition, a 3-deoxyglucosone-free fraction was separated from NAF. Changes occurring in these 3 fractions during heating were examined, particular attention being paid to the production of volatile carbonyl compounds. During heating, aldehyde was produced by AF and furfural by NAF. Results indicated that a 3-deoxyglucosone-containing fraction plays an important role in the production of volatile carbonyl compounds and also in the development of a maltol-like flavour compound in miso. [From En summ.] JA

124

[Gas-chromatographic determination of some flavour compounds in beer.] Über die

gaschromatographische Bestimmung einiger Aromakomponenten im Bier.

Kabaktschieva [Kabakchieva], G.; Goranov, N.; Rusev, P.

Nahrung 25 (6) 583-591 (1981) [8 ref. De, en, ru] [Inst. for the Brewing Ind., Sofia, Bulgaria]

In an attempt to find the best method for isolation, separation and determination of the aroma compounds determining beer quality, aroma compounds were isolated from a 12% original gravity special beer by extraction with inert gas, distillation, a head-space method or extraction with organic solvents. Extraction with diethylether/n-pentane (2:1) was the best method for extracting the aroma-forming higher alcohols and esters. After concentration, the compounds were successfully separated by GLC on a capillary column (2 m \times 2 mm) packed with a 12% Carbowax 20M/PEG 20M on Chromosorb W with flame ionization detection; n-butanol is used as the internal standard. IN

125

Study of volatile substances produced during the autolysis of champagne yeast.

Molnar, I.; Oura, E.; Suomalainen, H.

Acta Alimentaria 10 (1) 27-36 (1981) [7 ref. En] [Sci. Div. Res. Inst. of Viticulture & Oenology, Herman Otto ut 15, H-1022 Budapest, Hungary]

Various authors have claimed that sparkling wine aged in the presence of champagne yeast has better organoleptic properties than that aged in the absence of yeast, due to the products of autolysis. Comparisons were made between a tank-fermented sparkling wine and a model sparkling wine (12% alcohol, 1 g tartaric acid, 2 g malic acid and 1 g citric/l, each without (control) and with added Champagne Hautvillers yeast (5.0 g intact or 4.8 g disintegrated/l) stored at 10°, 20° or 30°C for 90 days. Samples were centrifuged at 3000 rev/min to remove sediment, the supernatants were extracted in isopentane for 24 h, concentrated to 1 ml and examined by GLC (details given) with methyl caprylate as internal standard. Compared with the control, considerable increases occurred in the volatile substances, particularly in ethyl caproate, ethyl palmitate and ethyl stearate; details are given for increases in 18 substances in tank-fermented and model wines, with and without disintegrated yeast. Disintegrated yeast released 2-5 \times as many volatiles as the intact yeast. Concn. of compounds with relatively low b.p. were almost independent of storage temp., but concn. of compounds with high b.p. increased markedly. Samples stored with disintegrated yeast at 10°C gave the best organoleptic evaluation, values declining with increasing temp. ELC

126

[Gas chromatographic analysis of beer aroma constituents.] Die gaschromatographische Analyse von Bieraromastoffen. [Review]

Liebl, M.; Seeleitner, G.

Mitteilungen der Versuchsstation für das Gärungsgewerbe in Wien 35 (11/12) 126-131 (1981) [19 ref. De]

127

[Possible applications and advantages of GLC analysis of spirits.] Anwendungsmöglichkeiten und Vorteile gaschromatographischer Analysen von Spirituosen.

Herr, S.

Alkohol-Industrie 94 (18) 416 (1981) [6 ref. De] [Lab. Dr. Liebich, Goethestrasse 9, 7592 Renchen/Baden, Federal Republic of Germany]

Applications of GLC analysis of volatiles in spirits are briefly considered, with special reference to evaluation of authenticity and quality of stone-fruit brandies, William pear brandy and wine brandies. AJDW

128

Isolation and identification of volatile compounds from roasted peanuts.

Ho, C. T.; Lee, M. H.; Chang, S. S.

Journal of Food Science 47 (1) 127-133 (1982) [En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

Volatile flavour compounds were isolated from 70 kg of freshly roasted Florida Runner peanuts by a specially designed apparatus. The isolated volatile flavour compounds were subjected to extensive gas chromatographic fractionation and the pure fractions obtained were identified by IR and MS. A total of 131 compounds was identified. The following compounds are reported for the first time as flavour components of roasted peanuts: 5 lactones, including γ -crotonolactone, 3-methyl- γ -crotonolactone and 5-hydroxy-4-nonenic acid, lactone; 4 pyrazines, 3 pyrroles; 3 pyridines, 13 sulphides, including 3 monosulphides, 6 disulphides and 4 trisulphides; 7 thiazoles, 2 thiophenes, 5 furanoids, including 2-methyl-3(2H)furanone; 5 oxazoles, 3 oxazolines, including 2-methyl-3-oxazoline; 12 hydrocarbons, 1 alcohol, 1 ketone, 2 acids, 2 esters, 2 acetoxy-2-butene, and maltol. IFT

129

Volatile components of cooked tubers of the water yam (*Dioscorea alata*).

Gramshaw, J. W.; Osinowo, F. A. O.

Journal of the Science of Food and Agriculture 33 (1) 71-80 (1982) [35 ref. En] [Procter Dep. of Food Sci., Univ. of Leeds, Leeds LS2 9JT, UK]

Tubers of *D. alata* var. White Lisbon, were peeled, cut into pieces and placed in cold water in a flask equipped with a modified Likens-Nickerson extraction head. The flask was heated and vapours were collected until 1 h after boiling commenced. Condensed vapours were extracted with pentane, and for separate analysis high-b.p. fatty acids were removed by extraction of the pentane with aqueous Na_2CO_3 . The concentrated essence was analysed by GLC-MS using glass capillary columns coated with Silanox/(Carbowax 20M + Atpet 80) or Silanox/SE30. Aroma of individual peaks was also assessed by exit port sniffing. Fatty acids were analysed as methyl esters; 6 were identified, mainly 16:0; followed by 18:2, 18:0, 15:0, 14:0 and 20:0. Volatile S compounds were analysed separately from the

pentane extract by TLC: H_2S and possibly propanethiol and butanethiol were produced during boiling. 29 further compounds were positively identified in the acid-free pentane extract; these comprised 7 hydrocarbons, 8 alcohols, 8 aldehydes, 4 ketones, 2-pentylfuran and dimethyl disulphide. The major non-acid component was 4-phenylbutan-2-one (approx. 18% of acid-free pentane extract) followed by α -pinene (9%), myrcene (7.5%) oct-1-en-3-ol (7%) and β -pinene (6%). Unidentified peaks accounted for 17.1% of total peak area. DIH

130

[Volatile components in the aroma of virgin olive oil. III. Reproducibility of the method of isolation, concentration and separation.

Dobarganes Garcia, M. C.; Olias Jimenez, J. M.; Gutierrez Gonzalez-Quijano, R.

Grasas y Aceites 31 (5) 317-321 (1980) [11 ref. Es, de, en, fr] [Inst. de la Grasa y sus Derivados, Seville, Spain]

The reproducibility of the method used for isolation, concn. and separation of volatile components of olive oil was examined by using three 2-l sub-samples of a 6 l batch. The method consisted of flushing with N_2 at 80°C (oil temp.), 30 l N_2 /h for 2 days/l oil, adsorption on active C, desorption with CS_2 and GLC (5% Carbowax on Chromosorb P, 3 min at 60°C, rinsing to 200°C at 2°/min). Tabulated results for 8 peaks (retention times 240-2280 s) were highly satisfactory except for some peaks of small size or high retention times: confidence limits for mean peak areas were <5% of their value, with a 95% confidence coeff. [From En summ.] [See FSTA (1979) 11 3N121 for part II.] RM

131

[Volatile components in the aroma of virgin olive oil. IV. Changes and effects on the aroma during ripening of Picual and Hojiblanca var. fruits.]

Olias Jimenez, J. M.; Gutierrez Rosales, L. F.; Dobarganes Garcia, M. C.; Gutierrez Gonzalez-Quijano, R.

Grasas y Aceites 31 (6) 391-402 (1980) [25 ref. Es, de, en, fr] [Inst. de la Grasa y sus Derivados, Seville, Spain]

Changes in volatile components of olive oil aroma during ripening were studied in samples of var. Picual (*Olea europaea rostrata*) and Hojiblanca (*O. europaea arolensis*) harvested at 4 dates in Dec.-Feb., and Dec.-March, resp. Tables and diagrams show the variations in acidity, peroxide value, A. O. M. (active O_2 method) stability and sensory quality (absolute grade, profile and reduced profile for odour and taste), qualitative changes in volatile components by GLC-MS (polar and apolar fraction), the sensory importance (sniffing) of the components in the aroma concentrate, and the % changes of components with sensory importance. [From En summ.] RM

132

Determination of volatile flavor constituents and residual carbohydrates during the fermentation of yogurt.

Brandao, S. C. C.

Dissertation Abstracts International, B 41 (7) 2541-2542; Order no. 8101084, 136pp. (1981) [En] [Michigan State Univ., East Lansing, Michigan 48824, USA]

Lactose, glucose and galactose contents of yoghurts during processing, fermentation and storage were evaluated by HPLC and volatile components by a modified head-space technique; *Streptococcus thermophilus* and *Lactobacillus bulgaricus* were used at 1:1 and 2:1 ratios. Lactase activity was observed mainly during fermentation, being very low during storage for 28 days. Lactose hydrolysis was faster using 1:1 but more extensive using 2:1 ratio. About 85% of the glucose and 10% of the galactose produced were metabolized. Conc. of aldehyde, ethanol, diacetyl and acetone increased during fermentation. Acetaldehyde content of yoghurt made using 1:1 and 2:1 ratios resp. was 25.5 and 19 p.p.m. Yoghurt stored for 14 days showed a slight decrease in acetaldehyde and a slight increase in ethanol concn.; changes were more pronounced on further storage. DMK

133

Capillary gas chromatographic determination of polycyclic aromatic compounds in vertebrate fish tissue.

Vassilaros, D. L.; Stoker, P. W.; Booth, G. M.; Lee, M. L. *Analytical Chemistry* 54 (1) 106-112 (1982) [71 ref. En] [Dep. of Chem. & Zool., Brigham Young Univ., Provo, Utah 84602, USA]

The analytical procedure includes aqueous alkaline digestion of fish tissue, acidification of the digestate with glacial acetic acid, extraction with methylene chloride, liquid-liquid partitioning with water and then a 10% KOH solution, adsorption chromatography on basic alumina, using hexane, benzene, and chloroform sequentially, gel permeation chromatography on BioBeads with methylene chloride, and capillary gas chromatography (GC) and GC/MS. Examples of chromatograms of polycyclic aromatic compound fractions from fish from polluted water [bullhead catfish from Black River and striped bass from Potomac River] and pristine water [bullhead catfish from Buckeye Lake] are given. The limit of detection is <0.2 ng/g wet tissue, and average recovery is 72% of spiked ¹⁴C-labelled anthracene. AS

134

Tainting of pork meat by 1,4-dichlorobenzene.

Watson, A.; Patterson, R. L. S.

Journal of the Science of Food and Agriculture 33 (1) 103-105 (1982) [1 ref. En] [ARC Meat Res. Inst., Langford, Bristol BS18 7DY, UK]

Pork meat rejected by consumers because of a nauseating taint was analysed by capillary gas chromatography and MS and found to contain 5-20 mg 1,4-dichlorobenzene/kg. Trace amounts (10-35 µg/kg) of 1,4-dichlorobenzene were found in wood-shavings used as litter materials and in the feedstuffs, but were considered insufficient to be the main cause of contamination. Meat from the following batch of pigs

from the same source contained only very small amounts, similar to those present in normal pork obtained elsewhere (> 25 µg/kg). Examination of data recorded by GLC-MS in the previous 2 yr showed that 1,4-dichlorobenzene was present in trace quantity (> 10 µg/kg) in several samples of normal meat, and appeared to be widespread in its occurrence. AS

135

How the flavour is sealed.

Anon.

Food Processing Industry 50 (600) 36-37 (1981) [En]

T. Lucas & Co. developed the Flavourseal system which is based on the encapsulation of all the key components of a flavour. The system uses a unique micro-encapsulation process to envelop the spice and herb oils and oleoresins with an impermeable coat, thus preventing the escape of volatiles. The effectiveness of Flavourseal seasonings in retaining their volatiles was demonstrated in storage tests for 12 wk at 20-22°C using 3 seasonings (ground spice seasoning, an extracted spice seasoning and a Flavourseal seasoning). Results are shown in graphs. VJG

136

Natural fruit flavours. A review on tropical fruits. [Review]

Ramteke, R. S.; Eipeson, W. E.; Patwardhan, M. V. *Indian Food Packer* 35 (3) 60-87 (1981) [156 ref. En] [Cent. Food Tech. Res. Inst., Mysore-570 013, India]

The review discusses the flavour compounds present and their role in fruit aroma production in tropical fruits like banana, grapefruit, lemon, lime, orange, bitter orange, guava, mango, pineapple, papaya and passion fruit. CFTRI

137

Food flavours

Govindarajan, V. S.

Indian Food Packer 35 (3) 15-24 (1981) [17 ref. En]

Aspects discussed include: characteristics of aroma compounds in natural and processed foods; classification of food aroma compounds (hydroxy compounds, aldehydes, ketones, esters, S compounds and other aroma compounds); true fruit flavour alone and combined with other natural flavours; essential oils; redistilled oils; terpeneless essential oils; oleoresins; nature-identical synthetic flavours; aromatic chemicals and artificial flavours; dry solubles and encapsulated flavours. CFTRI

138

[Flavor of shoyu (soy sauce). II.] [Review]

Yokotsuka, T.; Sasaki, M.; Nunomura, N.; Asao, Y.

Journal of the Society of Brewing, Japan [Nihon Joso Kyokai Zasshi] 75 (9) 717-728 (1980) [87 ref. Ja] [Cent. Res. Inst. of Kikkoman Co. Ltd., Noda-shi, Chiba, Japan]

A continuation of the review on the flavour components in soy sauce is presented. [See FSTA (1981) 13 10T571 for part I] YN

139

[Quality characteristics, and changes thereto as a result of preliminary preservation of 'Bobal' var. red grape juice. II. Effect of preliminary preservation treatments on the aromatic fraction and organoleptic acceptance.]

Diaz N., L. S.; Lafuente F., B.; Gasque P., F.
Alimentos 4 (1) 5-12 (1979) [16 ref. Es, en] [Inst. de Ciencias Químicas, Univ. Católica de Chile, Santiago, Chile]

Studies on effects of preservation methods on the flavour volatiles content and organoleptic quality of Bobal var. grape juice are described. Processes considered include: thermal sterilization; aroma stripping (with aroma recovery) and concentration; sulphitation/desulphitation; and concentration by vacuum evaporation. Flavour volatiles were analysed by GLC. Tables and diagrams of results are presented. Sterilization at 110°C for 8 s caused little modification of levels of flavour volatiles. Aroma stripping gave variable losses of flavour volatiles; appreciable further losses occurred if the juice was then further concentrated. Sulphitation/desulphitation gave lower losses of flavour volatiles than vacuum concentration. Organoleptic properties of the sulphitation/desulphitation samples were appreciably inferior to those of the other samples. [See *Alimentos* (1978) 3 (2) 5-13 for part I.] AJDW

140

[Changes in quality characteristics of red grape juice of the variety Bobal during storage. I. Aseptic storage.]

Diaz N., L. S.; Gasque P., F.; Lafuente F., B.
Alimentos 5 (1) 5-12 (1980) [16 ref. Es, en] [Inst. de Ciencias Químicas, Univ. Católica de Chile, Santiago, Chile]

Studies were conducted on deterioration of quality of Bobal var. grape juice during aseptic storage for up to 12 months at 0-5°C. Samples of natural or semi-conc. juices were used, stored under N₂ or air. Effects of storage with or without presence of aroma concentrate were also studied. Quality characteristics studied included colour, anthocyanin content, tannin content, hydroxymethylfurfural content, aroma volatiles, and organoleptic properties. Tables of results are given. Deterioration was greater for samples stored under air than for those stored under N₂. Deterioration of organoleptic properties and losses of aroma volatiles were greater for samples stored with than for those stored without aroma concentrate. AJDW

141

Coffee maker.

Martin, E.N. (Societe d'Assistance Technique pour

Produits Nestle SA)

United States Patent 4 300 442 (1981) [En]

A coffee making machine comprises a thin-walled moulded plastics shell-like housing with a 2-piece moulded core of heat insulating foam plastics sliding into the housing; a water supply unit, including a tank with a an electric heater means; a hot water dispenser; dehydrated granular coffee concentrate metering and dispensing unit; and a unit to receive and mix a coffee concentrate and hot water, with a coffee dispensing duct. [From En summ.] RAW

142

[Formation of volatile fatty acids by *Saccharomyces* yeasts during fermentation of grape musts.] Die Bildung von flüchtigen Fettsäuren durch *Saccharomyces*-Hefen während der Vergärung von Traubenmost.

Sponholz, W.-R.; Dittrich, H. H.; Haas, F.; Wünsch, B.
Zeitschrift für Lebensmittel-Untersuchung und -Forschung 173 (4) 297-300 (1981) [17 ref. De, en] [Inst. für Mikrobiol. & Biochem. der Forschungsanstalt, von-Lade-Strasse 1, D-6222 Geisenheim, Federal Republic of Germany]

Influence of fermentation of grape must with a pure yeast culture on composition of volatile fatty acids in wine was studied gas chromatographically, and, in the case of acetic acid, enzymically. 16 yeast strains were studied, using sterile grape juice as substrate. Initially this contained 38 mg formic acid/l and 30 mg acetic acid/l as predominant volatile acids. After fermentation, depending on strain, total volatile acidity was 330-630 mg/l, the major part of which (77-100%) was acetic acid, 310-580 mg/l. Also present in significant amounts were formic acid, 6-23 mg/l, and hexanoic acid, 4-9 mg/l. Propanoic, 2-methylpropanoic, butanoic, and 2- and 3-methylbutanoic acids were present at ≤ 1 mg/l each. Volatile acidity therefore consists of volatile fatty acids in musts fermented by pure cultures, the bulk of which acids are formed during fermentation. DIH

143

The evolution of champagne volatiles during ageing.

Loyaux, D.; Roger, S.; Adda, J.

Journal of the Science of Food and Agriculture 32

(12) 1254-1258 (1981) [17 ref. En] [Lab. d'Etude des Aromes, INRA, Jouy-en-Josas 78350, France]

The change in aroma composition during champagne ageing on yeast was studied by GLC and coupled GLC-MS of the volatiles trapped on Porapak Q. Analyses were made on samples kept on yeasts for 2 months and 1, 2, 3, 4, 5, 6, 7 and 16 yr. A rapid increase in the level of volatiles was noted in the first period. As ageing proceeded a slow decrease of nerolidol, isoamyl butyrate and hexyl acetate level was observed while vitispirane and benzaldehyde concn. increased. After a 16 yr period, benzaldehyde concn. increased to a level of 4 mg/l. AS

144

[Volatile compounds produced by yeasts.]

Stefano, R. di; Ciolfi, G.; Delfini, C.

Industria delle Bevande No. 55, 364-367 (1981) [7 ref. It]

The contents of compounds responsible for the characteristic bouquet of wines stem directly from the action of yeasts, and are dependent on the physical and chemical properties of the must, fermentation temp., storage temp. of finished product, length of maturing and storage periods. A study was carried out on the ability of 6 yeast strains ((i) *Saccharomyces cerevisiae*, (ii) *S. bayanus*, (iii) *S. uvarum*, (iv) *S. italicus*, (v) *S. rosei*, (vi) *Schizosaccharomyces pombe*) to produce volatile substances under strictly controlled physical conditions, utilizing a synthetic fermentation medium as well as a must from Cortese grapes; the amount of sugar used was closely monitored, and the product was kept at 0°C

for 15 days after the end of fermentation, during which it was examined by gas chromatography. 23 volatile compounds were isolated in the case of the synthetic medium, 26 in the case of the natural medium (must). From results obtained (fully tabulated) it was concluded that (i) and (iv) are responsible for considerable production of esters and fatty acids, although (iv) did not wholly ferment the synthetic medium ($\leq 3.6^\circ$ alcohol); (ii) gave a modest production of all compounds save alcohols; (iii) produced large amounts of 2-phenylethanol and isovaleric acid and considerable amounts of esters; and (v) gave limited amounts of esters, but larger quantities of 3-ethoxy, 1-propanol than all the other strains. The most important constituent attributable to (vi) was acetyl methyl carbinol, but this strain produced esters of fatty acids only as traces. KME

145

A method for detecting volatile amines in grapes and wines.

Daudt, C. E.; Ough, C. S.

American Journal of Enology and Viticulture 31 (4) 356-359 (1980) [13 ref. En] [Dep. of Viticulture & Enology, Univ. of California, Davis, California 95616, USA]

A method for determining amines is given, which involves double vacuum distillation, derivatization with trifluoroacetic anhydride, extraction with ether after NaHCO_3 wash, and gas chromatography of the sample with a N detector. Recoveries of typical amines varied from 67.2 to 80.5%. Relative s. d. of peak areas in replicates of one wine detn. were high for some peaks, suggesting incomplete collection of the distillate, but generally were $< 10\%$. Examples of chromatograms and mass spectra are presented, with a table of retention times. JRR

146

[Gas chromatographic determination of volatile components in extract-containing spirits.]

Gaschromatographische Bestimmung der flüchtigen Inhaltsstoffe in extraktaltigen Spirituosen.

Postel, W.; Adam, L.

Ernährung 5 (10) 497-502; (12) 593-596 (1981) [24 ref. De] [Lehrstuhl für Allgemeine Lebensmitteltech., Tech. Univ. München, D-8050 Freising-Weihenstephan, Federal Republic of Germany]

The transfer of 21 selected volatile components (alcohols, aldehydes esters) into the distillate during distillation of spirits was assessed in trials using model solutions; effects of variations in alcohol content of the sample, concn. of volatile components, and distillation duration were considered. Results are presented in tabular or diagrammatic form on: % distribution of the 21 volatiles in 8 fractions for solutions containing 10, 20 or 40 vol.% alcohol; recoveries in the distillate of the 21 volatiles at 1, 2 \times or 3 \times concn. in a 20 vol.% alcohol solution; and recoveries for a distillation period of 30, 45 or 90 min; distillate and residue were analysed by gas chromatography. Results (discussed in detail) can be used as basic working principles for the distillation of volatile components from extract-containing spirits and subsequent gas chromatographic quantitative analysis of the distillate. RAW

147

[Studies on off-flavour formed during storage of satsuma mandarin juice. III.]

Shimoda, M.; Osajima, Y.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 55 (4) 319-324 (1981) [10 ref. Ja, en] [Lab. of Food Analysis, Dep. of Food Sci. & Tech., Fac. of Agric., Kyushu Univ., Fukuoka 812, Japan]

Quantitative changes in volatile compounds were investigated during storage at 20°, 30° and 40°C. Terpene hydrocarbons recovery decreased by 20-30% during the early stage of storage, and then increased gradually with storage time. After reaching max. at 13 days (40°C), 40 days (30°C) and 80 days (20°C), terpene hydrocarbons recovery again decreased. β -Pinene decreased rapidly and its recovery was only 13% after 40 days storage at 30°C. Citronellal decreased by about 50% during 40 days at 20°C, vs. 90% during the same period at 30°C. The amount of linalool increased during the early stage of storage, and reached max. at 40 days (30°C) and 80 days (20°C). The storage periods for furfural formation of 100 parts/billion were 8 days at 40°C, 24 days at 30°C and 75 days at 20°C. At furfural level of 100 parts/billion the juice contained fenchyl alcohol (0.07-0.08 parts/billion), terpinen-4-ol (1.0-1.4 p.p.m.), β -terpineol (0.7-0.8 p.p.m.) and α -terpineol (4.2-4.4 p.p.m.). It was concluded that furfural level was a useful indicator of off-flavour development in Satsuma mandarin juice. [See FSTA (1982) 14 3H527 for part II.] AS

148

Instrumental analysis of volatiles in air- and nitrogen-packed peanut butter.

Fore, S. P.; Fisher, G. S.; Legendre, M. G.; Wadsworth, J. I.

Peanut Science 6 (1) 58-61 (1979) [26 ref. En] [S. Reg. Res. Cent., Sci. & Education Admin., USDA, New Orleans, Louisiana 70179, USA]

Air- and N_2 -packed samples from the same production lot of peanut butter, stored in the dark at 25°C for 1 yr, were analysed periodically by direct gas chromatography. The ratio of methylbutanal to hexanal was consistently higher in N_2 -packed than in equivalent air-packed samples and decreased throughout the storage period for both types of samples. Correlation coeff., significant at 0.1%, were 0.99 for N_2 -packed and 0.96 for air-packed samples. A total of 35 volatile components of peanut butter was identified by combined direct gas chromatography - MS, and another 6 were tentatively identified. AS

149

[Flavour development in strawberries. VII. Substrate specificity in biosynthesis of volatile esters in strawberry fruit.]

Yamashita, I.; Iino, K.; Yoshikawa, S.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 28 (6) 256-259 (1979) [8 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric., Forestry & Fisheries, Kannondai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken, Japan]

Various aliphatic alcohols and volatile fatty acids were incubated in a flask with whole strawberries at 30°C for 90 min. The headspace volatiles produced were analysed by gas chromatography. Primary and

secondary aliphatic alcohols (including straight-chain, branched, saturated and unsaturated types) were found to be utilized during incubation which resulted in their esterification; tertiary alcohols were not utilized. Strawberry acids (e.g. acetic, n-butyric, n-caproic) and other acids (e.g. isovaleric, n-valeric, isocaproic) were esterified during incubation with strawberries; formic acid was not esterified. Results for propionic and isobutyric acids were inconclusive because of the low conversion rate and poor reproducibility. A clear correlation was established between substrate specificity and the volatile esters present in strawberry fruit. [From En summ.][See FSTA (1980) 12 5]759 for part VI.] JA

150

Volatile flavor components of beli fruit (*Aegle marmelos*) and a processed product.

MacLeod, A. J.; Pieris, N. M.

Journal of Agricultural and Food Chemistry 29 (6) 1262-1264 (1981)[11 ref. En][Dep. of Chem., Queen Elizabeth Coll., Univ. of London, Campden Hill Road, London W8 7AH, UK]

Representative samples of the aroma volatiles of beli - a tropical fruit - and a canned, processed product (beli cream or puree) were obtained by established procedures. Components of the essences were identified as far as possible by GLC-MS using both electron impact and chemical ionization mass spectrometry. The major aroma component of the fruit was *cis*-linalool oxide which constituted about 1/3 of the total volatiles. Other important aroma compounds included alcohols and esters (saturated and unsaturated), monoterpenes, and sesquiterpenes. α -Phellandrene was the one compound described as having typical beli aroma on odour evaluation at an odour port during GC. Beli cream produced a larger total quantity of volatiles than the fruit (about 10 times) and a broader spectrum of mono- and sesquiterpenes. It was, however, lacking in a few important components. Overripe fruit contained much lesser amounts of linalool oxides and linalool and probably would not be suitable for processing purposes. AS

151

Volatile flavor compounds from shallots.

Wu, J. L.; Chou, C. C.; Chen, M. H.; Wu, C. M.

Journal of Food Science 47 (2) 606-608 (1982)[En][Dep. of Food Sci., Food Ind. Res. & Development Inst., PO Box 246, Hsinchu 300, Taiwan]

Approx. 0.030%, 0.012% and 0.005% (v/w), in wet wt., of volatile oils were obtained from raw, baked and deep-fried shallots, resp. These oils were studied by gas chromatography coupled to MS. The flavour components of these oils can be classified in the following categories: thiols, monosulphides, disulphides, trisulphides, thiophenes and oxygen compounds. After heating (baking or deep-frying) of the shallot, a sharp increase in the amount of dimethylthiophenes was observed and the alkyl propenyl disulphides decreased. IFT

152

Studies on roasted peanuts and peanut butter flavor.

Lée, M.-H.

Dissertation Abstracts International, B 40 (12) 5598: Order no. 80-13170, 255pp. (1980)[En][Rutgers Univ., New Brunswick, New Jersey 08903, USA]

Objects of the investigation were to systematically identify the volatile compounds responsible for peanut flavour, and further to recover these compounds lost during processing and to return them to commercial products. Strong, roasted peanut flavours were collected by means of cold traps placed in a manufacturing plant; the volatile components were then extracted from the total condensate in bland peanut oil and added to commercial peanut butter. Sensory evaluations showed that the flavour-enriched samples had a stronger odour, but unpleasant sulphur-like odours were also present and the control sample was preferred. A total of 116 compounds was identified in

freshly-roasted peanuts (details given). The 3 major components of roasted peanut flavour were identified as nutty, cheesy and garlic odours. Isobutyric acid and valeric acid have a cheesy odour and were also major compounds quantitatively. Other major compounds present quantitatively were methylpyrazine, 2,6-dimethylpyrazine and 2-methyl-5-ethylpyrazine which have a nutty odour. Sulphides were found only in trace amounts, but most of them had a strong garlic or onion-like flavour. Other odours collected in the collection traps but not recorded as components of roasted peanut flavour were various γ -crotonolactones, with odours described as 'green beany', 'nutty' and 'garlic'. ELC

153

Volatiles of parsley roots after storage under different relative humidity conditions. [Lecture]

Kraxner, U.; Weichmann, J.

Acta Horticulturae No. 116, 47-54 (1981)[13 ref. En][Chair of Veg. Crops, München Tech. Univ., D-8050 Freising-Weißenstephan, Federal Republic of Germany]

3 cv. of parsley roots were stored at 0-1°C and at 2 different RH (97-100% and 79-89%) for 2, 4 and 6 months. After storage, the levels of volatiles and the composition of the parsley-root oil was assessed with gas chromatography. Contents of parsley root oil increased during storage, in proportion to the water vapour pressure deficit during storage. The changes in the various components were not related to RH, but both oil content and the effect of storage duration on the components of the oil differed between cv. The relationships between individual components were investigated using multiple regression analysis. [See FSTA (1982) 14 7]928.] JRR

154

Characterization of aroma components of corn.

Wade, J. H.

Dissertation Abstracts International, B 42 (5) 1809: Order no. 8123105, 145pp. (1981)[En][Univ. of Georgia, Athens, Georgia 30601, USA]

Headspace analysis (HA) and steam distillation (SD) were used to isolate and characterize aroma components in dried, fresh and cooked corn. For all

3 types of corn, the retention times of compounds isolated by HA differed from those of compounds isolated by SD. 2 compounds having a characteristic 'dry-grainy' odour were detected in dried corn by HA. SD revealed 2 compounds with a 'dry-grainy' odour in dried corn, one being identified as hexanol by GLC-MS; SD also revealed a third compound having an odour like that of the original dried corn. HA of fresh corn revealed 3 compounds having odours characteristic of fresh corn, one being identified as methanol, while SD revealed 2 such compounds. 3 compounds having the characteristic odour of cooked corn were detected in cooked corn by HA; 2 of these compounds were identified as dimethyl sulphide and ethanol. SD of cooked corn revealed 4 compounds having an odour similar to that of cooked corn; one of these compounds was identified as acetal. A total of 22 compounds was identified in the 3 corn products by GLC-MS and via GLC retention times, 9 of these compounds being detected in corn for the first time. JA

155

[Role of sulphur compounds in aroma formation of ham products.]

Vorontsov, A. A.

Tovarovedenie 14, 46-48 (1981) [Ru]

This review-type article analyses existing theories on aroma formation in meat during processing. Effect of volatile S-containing compounds on the quality of pork products is considered, with particular reference to formation of the specific 'ham' aroma. RAW

156

Production of off odours by isolates from poultry skin with particular reference to volatile sulphides.

Thomas, C. J.; McMeekia, T. A.

Journal of Applied Bacteriology 51 (3) 529-534 (1981) [18 ref. En] [Dep. of Agric. Sci, Univ. of Tasmania, GPO Box 252C, Hobart, Tasmania 7001, Australia]

Studies were conducted on off-odour production by psychrotrophic *Pseudomonas* strains isolated from broiler skin. *Pseudomonas* strains were cultured on sterile leg muscle and broiler skin preparations; production of S-containing volatiles on peptone broth (supplemented with methionine and cystine) and on muscle or skin as also studied. *Pseudomonas* groups I and II were the main off-odour producers. Overall, 40% of isolates produced organoleptically-detectable off-odours. Strains producing off-odours on muscle also produced them on skin. 60% of *Pseudomonas* group I strains produced off-odours, vs. 38% of group II strains. Sulphide-type odours predominated, being produced by group I and group III/IV strains; group II strains mainly produced fruity odours, although 30% also gave a sulphide-type taint. Culture in broths supplemented with methionine or cystine increased the proportion of samples producing sulphide off-odours. Methanethiol was the main off-odour produced; H₂S is produced only by a minority of strains. AJDW

157

The mass spectra of the trimethylsilyl derivatives of ginger constituents.

Harvey, D. J.

Biomedical Mass Spectrometry 8 (11) 546-552 (1981) [16 ref. En] [Univ. Dep. of Pharmacology, South Parks Road, Oxford OX1 3QT, UK]

This study was carried out to clarify the mechanism giving rise to the main features of the mass spectra of trimethylsilyl (TMS) derivatives of the pungent principles of ginger. Fragmentation mechanisms were studied with the help of deuterium labelling by preparing TMS, [²H₃]TMS, methyl ether-TMS and [²H₃]methyl ether TMS derivatives of zingerone, zingerol, gingerols, shogaols, gingerdiones, gingediols, tetrahydrocurcumin and deshydroxytetrahydrocurcumin. Mass spectra of the main derivatives are illustrated and fragmentation mechanisms are proposed. DIH

158

Major volatiles in Sri Lankan arrack, a palm wine distillate.

Samarajeewa, U.; Adams, M. R.; Robinson, J. M.

Journal of Food Technology 16 (4) 437-444 (1981) [21 ref. En] [Coconut Res. Inst., Lunuwila, Sri Lanka]

Arrack samples from commercial distilleries and made by laboratory fermentation and distillation of sweet toddy were studied. Distillate samples were sealed in glass vials and sweet toddy samples were pasteurized and stored in sterile bottles. Qualitative and quantitative analyses were carried out using gas chromatography. The major volatiles present in several commercial arrack samples were found to be similar to those in other potable spirits, although their individual concn. differ. Variation between brands is attributed to differences in the quality of the fermented toddy used. Ethyl lactate was found in all samples analysed and it is thought that production of this ester is a characteristic feature of mixed lactic-alcoholic fermentations. SP

159

[Spectrophotometric determination of acetaldehyde in wines.]

Ballesta, L.; Olea Serrano, M. R.; Garcia-Villanova, R. *Anales de Bromatologia* 32 (4) 367-373 (1980) [9 ref. Es, en] [Univ. de Granada, Granada, Spain]

A spectrophotometric method was developed for the detn. of acetaldehyde in wine, based on the formation of acetaldehyde semicarbazone and its detn. at 223 nm. It is suitable for small samples and faster than other methods for the range of 8.8-61.6 mg/l at pH 3.5, and may be used for free and SO₂-combined acetaldehyde with a relative error of the mean of $\pm(0.43-1.09)$ for free or $\pm(0.44-1.17)$ for SO₂-combined acetaldehyde resp. RM

160

Production of lime juice concentrates using the serum-pulp method.

Askar, A.; El-Samahy, S. K.; Abd-El-Baki, M. M.; Ibrahim, S. S.; Abd-El-Fadde, M. G.

Alimenta 20 (5) 121-128 (1981) [24 ref. En, de] [Fac. of Agric., Univ. of Zagazig, Zagazig, Egypt]

Lime juice (*Citrus aurantifolia* Swingle) was concentrated using 4 methods: (i) freeze concn. of the juice, (ii) vacuum evaporation of the juice with "cut-back" with pasteurized juice, centrifugal separation into pulp and serum followed by (iii) freeze concn. or (iv) evaporation of serum and recombination with the pulp. The chemical composition of fresh, pasteurized and conc. lime juice, and the effects of 330 days' storage at -12° or 4.5°C on chemical composition and flavour compounds are shown in tables, and effects of processing (centrifugation time and speed) and storage on some components (limonene, oxygenated terpenes, ester and carbonyl compounds, ascorbic acid) in diagrams. Results showed that the pulp (5% of whole juice) contained most of the important flavour materials. Increasing centrifugation speed and time increased the % pulp content. Best quality concentrates were obtained by method (iii), followed by (i), (iv) and (ii). Very good quality was maintained during 270 days frozen or 90–150 days cold storage. RM

161

The contribution of some fermentation products to the odor of dry white wines.

Merwe, C. A. van der; Wyk, C. J. van
American Journal of Enology and Viticulture 32 (1) 41–46 (1981) [21 ref. En] [Oenological & Viticultural Res. Inst., Stellenbosch, 7600 S. Africa]

This study was undertaken in view of the general concept that some fermentation products, particularly fatty acid esters and higher alcohols affect the bouquet and quality of white table wines. Gas chromatographically purified esters and higher alcohols were added in a variety of combinations to a deodorized wine and evaluated for odour intensity and quality. A combination of 6 fatty acid esters at levels representative of their concn. in premium quality white table wines, improved the odour quality and intensity significantly. A mixture of isoamyl, n-hexyl and 2-phenethyl acetate as well as a mixture of ethyl-n-hexanoate, ethyl-n-octanoate and ethyl-n-decanoate had similar quality enhancing effects, but not as pronounced as the combination of both mixtures. The addition of 100 mg/l ethyl acetate caused a highly significant decrease in odour quality, whereas additions of isoamyl alcohol and isobutyl alcohol at levels representative of their concn. in standard white table wines, had no significant influence on odour quality. AS

162

Some volatile components of *Vitis vinifera* variety Cabernet Sauvignon wine.

Slingsby, R. W.; Kepner, R. E.; Muller, C. J.; Webb, A. D.
American Journal of Enology and Viticulture 31 (4) 360–363 (1980) [19 ref. En] [Dep. of Chem., Univ. of California, Davis, California 95616, USA]

A 170-l sample of 1975 Monterey County Cabernet Sauvignon wine of intense aroma was extracted with successive portions of dichloromethane. After neutralization of the acids in the extracts, drying, and removal of the solvent, the essence was analysed by gas chromatography, coupled gas chromatography-MS, and Kovats' indices. Of particular interest among the 40

compounds identified were *cis*-2-hexen-1-ol, *cis*-3-hexen-1-ol, styrene, phenylacetaldehyde, ethyl furoate, diethyl maleate, diethyl malonate, 1,1,6-trimethyl-1,2-dihydronaphthalene, and ethyl cinnamate.

2-Methoxy-3-isobutyl pyrazine could not be identified in the extracts from the wine, nor in extracts when the wine had been made strongly basic and reextracted. AS

163

Effect of lipolytic acyl hydrolase on the activity for six carbon aldehyde formation in tea chloroplasts.

Sekiya, J.; Kajiwar, T.; Imoto, M.; Inouye, S.; Hatanaka, A.

Journal of Agricultural and Food Chemistry 30 (1) 183–185 (1982) [16 ref. En] [Rep. of Agric. Chem., Univ., Yamaguchi 753, Japan]

Aspects of formation of C6 aldehydes, important flavour compounds, in tea leaves were studied, in particular formation of 1-hexanal from linoleic acid (C18:2) by isolated chloroplasts. Treatment of tea chloroplasts with potato lipolytic acyl hydrolase (LAHase) greatly reduced rate of formation of hexanal from C18:2. Composition of treated and untreated chloroplasts is tabulated; LAHase treatment did not affect chlorophyll content, slightly decreased crude total lipid and protein content and reduced galactolipids and phospholipids to approx. 20 and 30% resp. of their initial levels. Treatment of chloroplasts with snake venom phospholipase A₂ caused no loss in hexanal formation activity, suggesting that loss of galactolipids from chloroplasts affects activity of the membrane-bound system that produces hexanal. This system consists of lipoxygenase and hydroperoxide lyase. Activity of hydroperoxide lyase in LAHase-treated chloroplasts was unaffected; hexanal was formed from C18:2-13-hydroperoxide with undiminished activity, suggesting that LAHase treatment affects a preliminary oxidation step in hexanal formation. Harvesting, storage and processing of tea leaves may result in LAHase attack of membrane lipids; while this may result in formation of C18 free fatty acids which are good substrates for hexanal formation, the LAHase-induced degradation of membrane lipids may itself inactivate the C6-aldehyde formation system. DIH

164

Use of C₁₈ reversed-phase liquid chromatography for the isolation of monoterpene glycosides and nor-isoprenoid precursors from grape juice and wines.

Williams, P. J.; Strauss, C. R.; Wilson, B.; Massey-Westropp, R. A.

Journal of Chromatography 235 (2) 471–480 (1982) [33 ref. En] [Australian Wine Res. Inst., Private Bag, PO Glen Osmond, S. Australia 5064, Australia]

It is now known that the terpene flavours of grapes are derived from a pool of monoterpene glycosidic derivatives. Previous methods for isolation of monoterpene glycosides from grape juice and wines have proved to be unsuitable due to the presence of glucose and fructose in grape juice and of glycerol and butane-2,3-diols in wines. A new method is reported based on chromatography of juice or wine on a C₁₈-bonded reversed-phase absorbent, which achieves

separation of the monoterpene glycosides and some of their oxidation products. Juice or dealcoholized wine was applied to a 470 × 15 mm column of reversed-phase C18 absorbent, flushed with 3 × its vol. of water, eluted with methanol and dried in vacuo; 2 l grape juice yielded 100 mg concentrate. Further separation was obtained on the C18 column and successive flushing with water, 20% acetic acid, water, 30% acetic acid, water and methanol. Final hydrolysis of fractions is described, with ultimate analysis by gas chromatography (GC) or GC-MS. Tables and chromatograms show evidence for the presence of 56 compounds, some previously unknown, concentrated by a factor of 20 000 in a single chromatographic step. The process also led to the discovery of precursors of 2-phenylethanol, benzyl alcohol, damascenone, vitispirane and 1,1,6-trimethyl-1,2-dihydronaphthalene. ELC

165

Wine flavour extraction with liquid carbon dioxide. Jolly, D. R. P.

Process Biochemistry 16 (5) 36–40 (1981) [10 ref. En]

3 commercial carbons (i) Hydrodarco ON30, (ii) Tsurumicoal HC 17 and (iii) Actacarb G, mesh size 4 × 12, 6 × 16 and 5 × 10, resp., were investigated to determine their suitability for absorption of flavour compounds from wine prior to distillation into fortified spirits. Ground samples of the 3 carbons were stirred with a white wine, under N₂, for 90 min. The slurry was filtered under N₂, washed with distilled water and air-dried for 24 h. The carbons were extracted with Freon, filtered, and the solvents removed at 35°C. Extracts of spent wine were also collected. Gas chromatographic analyses of the extracts showed flavour removal to be significantly better for (ii) and flavour recovery was 50% of original. Extraction of the flavour saturated (ii) with diethyl ether gave much improved desorption of the flavours. Laboratory tests were set up to establish flavour components removal from a given wine at set operating temp. and flow rate in a continuous absorption column, (ii) being selected as the carbon. Results showed that (ii) had a high absorptive capacity, and that flavour material was not removed from the wine selectively. A pilot plant was therefore set up on the basis of these experiments, using (ii) as carbon and dry white table wine from Doradillo grapes as the sample material. Extraction of the control carbon with liquid CO₂ gave an unpleasant extract; extraction of wine saturated carbon produced an extract in the form of an oil with a wine fruit odour, masked by the taint of the charcoal. It was concluded that the use of carbon as an intermediate in the preparation of an extract was quite feasible although a carbon would have to be chosen which had no off-flavours extractable by liquid CO₂. SP

166

Volatile components of Albana wine. II. Alcohol-free fraction.

Capella, P.; Carnacini, A. B.; Riponi, C.; Amati, A. *American Journal of Enology and Viticulture* 31 (3) 216–218 (1980) [20 ref. En] [Istituto di Agrarie, Univ. of Bologna, Bologna, Italy]

Alcohols of the volatile fraction concentrate of an Albana wine were removed by partitioning between propylene glycol and trichlorofluoromethane. The alcohol-free fraction was then studied by gas chromatography-MS. 37 compounds were identified, 32 of which were esters. [See FSTA (1975) 7 5H670 for part I.] AS

167

A pilot-plant cellulose acetate gel bead column for the removal of limonin from citrus juices.

Johnson, R. L.; Chandler, B. V.

Journal of the Science of Food and Agriculture 32 (12) 1183–1190 (1981) [10 ref. En] [CSIRO, Div. of Food Res., North Ryde, NSW 2113, Australia]

A description is given of a pilot-plant column packed with cellulose acetate gel beads for the removal of the bitter principle limonin from pasteurized citrus juices, at about 20°C. The column had a bed vol. (BV) of 11.5 l and in a representative run passage of juice (11 BV) through the column at a flow rate of 2.5 BV/h reduced limonin content of juice from 19.2 to 10.9 mg/l. The adsorptive process can be described by standard mathematical equations and from these equations the theoretical performance of units consisting of 2 or more columns in series or parallel can be calculated. For example, passage of juice (20 BV) containing 35 mg limonin/l through 2 columns in series would reduce the limonin content to 14 mg/l compared with 19 mg/l following passage through parallel columns. Treatment of fresh, unpasteurized juice reduced limonin contents by only 15% but treatment of freshly pasteurized juice was almost as successful as that of 1-day-old pasteurized juice. Since, like freshly extracted juice, freshly pasteurized juice is not bitter, it is suggested that 2 non-bitter limonin precursors are involved in bitterness development, only 1 of which is adsorbed by cellulose acetate. AS

168

Reactivation of the cellulose acetate gel bead column used for the removal of limonin from citrus juices.

Johnson, R. L.; Chandler, B. V.

Journal of the Science of Food and Agriculture 32 (12) 1191–1196 (1981) [9 ref. En] [CSIRO, Div. of Food Res., North Ryde, NSW 2113, Australia]

Simple water washes reactivated a cellulose acetate gel bead column after its use to remove the bitter principle limonin from citrus juices on a pilot-plant scale, preferably after the passage of 10 bed vol. (BV) of juice. Initially, washes with water equal in vol. to the treated juice were effective because they removed inhibitors of limonin adsorption but the column would eventually become poisoned. A regime was established for long term operation of the column from the results of monitoring the limonin content and COD of the wash waters. These results could be fitted to standard mathematical equations for extraction processes and these equations were used, in conjunction with previously developed equations for adsorption of limonin from citrus juices, to calculate the conditions for steady-state operation of the column. A 3-column unit is suggested as a suitable basis for the adsorptive

treatment of juice within a continuous processing line. Ten BV of juice would be passed through 2 of the columns in series at 2.5 BV/h reducing the limonin content by about 50–70% while the third column was being reactivated by the passage of 16 BV of warm water at 3.8 BV/h. After 4 h, the first of the 2 linked columns would be reactivated and the 2nd would become the first of the new pair of linked columns with the newly reactivated column as the 2nd component. AS

169

Studies on the characteristics of scented rice. VII. Effect of parboiling treatment on some fatty acid compositions and flavor components in rice grains.

Tsuzuki, E.; Tanaka, K.

Bulletin of the Faculty of Agriculture, Miyazaki University [Miyazaki Daigaku Nogakubu Kenkyu Jiho] 28 (1) 25–30 (1981) [9 ref. En] [Lab. of Crop Sci., Miyazaki Univ., Miyazaki, Japan]

Several rice var. (Panbira from Pakistan; Bau 157 from Vietnam; Hendoyori, and Karasu – scented rice – and Mizuho – ordinary rice – from Japan; Sachupak and W 438 from Malaysia) were harvested 45 days after heading, dried, parboiled, i.e. after soaking for 3.5 h at 70°C in water, unhulled rice grains were steamed at 15 min/100°C, air-dried at approx. 20°C and hulled. Gas chromatography was used to analyse fatty acids and volatile carbonyl compounds. Oleic acid and volatile carbonyl compound (e.g. propionaldehyde, valeraldehyde, capronaldehyde) contents were higher after parboiling; linoleic and linolenic acid contents were decreased by parboiling. It is surmised that parboiling altered unsaturated fatty acid profiles, thus influencing flavour components. [See FSTA (1981) 13 3M259 for part VI.] LH

170

[Studies on the characteristics of scented rice. VIII. Effect of storage conditions on some fatty acid compositions and flavor components in rice grains.]

Tsuzuki, E.; Tanaka, K.; Shida, S.

Bulletin of the Faculty of Agriculture, Miyazaki University [Miyazaki Daigaku Nogakubu Kenkyu Jiho] 28 (1) 31–37 (1981) [9 ref. Ja, en] [Lab. of Crop Sci., Miyazaki Univ., Miyazaki, Japan]

Fatty acid and flavour compound profiles during storage of hulled rice (Hendoyori, Karasu, Shiratama, Keitoku, Sabarmati, Enshu-mochi, Nangoku-mochi, Nipponbare and Mizuho var.) at 10° or 30°C were investigated using gas chromatography. Oleic acid content increased on storage, more so at 30°C; linoleic acid content (except in scented var. Shiratama and Sabarmati) decreased on storage, more so at 30°C; linolenic and palmitic acid content trends varied with rice var. Propionaldehyde, valeraldehyde and capronaldehyde were the major flavour compounds present, and storage at 30°C increased their levels. Unsaturated fatty acid content decreased on storage, producing carbonyl breakdown products. [From En summ.] [See preceding abstr. for part VII.] LH

171

Volatile sulfur compounds and other headspace constituents of North Sea fish oils.

Christensen, B. W.; Kjaer, A.; Madsen, J. O.

Journal of the American Oil Chemists' Society 58 (12) 1053–1057 (1981) [19 ref. En] [Dep. of Organic Chem., Tech. Univ. of Denmark, 2800 Lyngby, Denmark]

Headspace fractions of industrial oils produced from North Sea fish were studied with emphasis on their S-containing constituents, suspected inhibitors in the subsequent catalytic oil hardening process. 14 individual volatile S compounds were identified, accounting for virtually the total amount of such compounds in the volatile fraction. Sulphides, linear and cyclic di- and polysulphides, and a homologous series of methyl thioesters, together make up the chemical patterns. Gas chromatography combined with MS revealed a complex, but surprisingly constant pattern of the total, volatile fractions of several North Sea fish oils. About 100 individual compounds, including those containing S were fully or partly identified. The structural characteristics and possible origin of the various types of compounds are discussed briefly. AS

172

[Contents of some aroma compounds and organoleptic characteristics of sweet cream and cultured cream butters during storage.]

Grinene[Griniene], E.; Rodionova, L.

Trudy, Litovskii Filial Vsesoyuznogo Nauchno-issledovatel'skogo Instituta Maslodol'noi i Syrodol'noi Promyshlennosti 14, 89–97, 157 (1980) [6 ref. Ru, li, en] [Litovskii Filial VNIIMSP, Kaunas, USSR]

Top quality sweet cream and cultured cream 16% fat butters made in Lithuanian butter factories were examined initially and after storage for 3 and 12 months at –18°C. Mean values are tabulated for contents of (i) C2–C8 free volatile fatty acids, (ii) 10 C10–C18:2 free fatty acids, and (iii) 7 C10–C20 lactones. Total contents at the 3 measurements for the 2 types of butter resp. were (mg%): (i) 1.64, 0.86 and 1.44, and 1.56, 2.42 and 2.82; (ii) 179.1, 189.4 and 189.5, and 145.0, 174.9 and 182.1 the increases being mainly in the unsaturated fraction; and (iii) 22.4, 18.0 and 69.9, and 17.8, 27.2 and 36.7. Contents of lower-molecular aroma lactones decreased and higher-molecular lactones increased, during storage. Organoleptically all samples had deteriorated during storage for 12 months. SKK

173

Enhancement of Domiati cheese flavour with animal lipase preparations.

El-Neshawy, A. A.; Abdel-Baky, A. A.; Farahat, S. M. *Dairy Industries International* 47 (2) 29, 31 (1982) [17 ref. En] [Food Sci. Dep., Zagazig Univ., Zagazig, Egypt]

Domiati cheese was made from a 1:1 mixture of buffaloes' and cows' milk to which was added, after salting, 0.02 or 0.04% of 1 or 2 commercial lipase preparations, namely Cacordase (Dumman World Trade Corp., Wisconsin, USA) or Kapalase (Dairyland Food Lab., Waukesha, USA). Cheese made with either lipase preparation had excellent flavour and highly acceptable consistency at 4 wk, the flavour being more

intense than that of control cheeses at 8 wk. However, a rancid flavour was detected at 8 wk in cheeses made from milk treated with 0.04% lipase. Cheese made from lipase-treated milk had slightly higher moisture content, acidity and protein degradation rate, lower fat % (on dry basis) and higher free fatty acid content than control cheeses. CDP

174

The isolation of volatile sulphur compounds from cooked hens eggs using two novel trapping methods. (In 'Quality of eggs. Proceedings of the First European Symposium' [see FSTA (1982) 14 8Q120]) [Lecture] Flanders, A.; Beswick, G.; Rosie, D. A. pp. 153-162 (1981) [9 ref. En] [Dep. of Applied Biol. & Food Sci., Polytechnic of the South Bank, London SE1 0AA, UK]

Volatile S compounds from the headspace of boiled eggs were trapped by 2 methods: (i) simultaneous solvent extraction (using diethyl ether) and liquid N cold-trapping, and (ii) adsorption on a Tenax GC column. The isolates were then analysed by GLC with flame photometric detection in the S mode. Studies with model mixtures showed (ii) to give higher recoveries than (i). 11 volatiles were isolated by (i), H_2S , methanethiol, ethanethiol, dimethyl sulphide and dimethyl disulphide being identified. 21 volatiles were isolated by (ii); the same 5 compounds as for (i) were identified. No apparent artefact formation was observed with (ii). AJDW

175

Flavor volatiles of scrambled egg products as affected by composition. (In 'Quality of eggs. Proceedings of the First European Symposium' [see FSTA (1982) 14 8Q120]) [Lecture] Hsu, S. Y.; Chen, T. C.

pp. 135-143 (1981) [19 ref. En] [Poultry Sci. Dep., Mississippi State Univ., Mississippi 39762, USA]

Effects of the composition of scrambled egg mix on the flavour volatiles were studied; constituents considered included yolk, albumen, dried skim milk, corn oil, and lactic acid. Data are given for effects of omission of individual constituents on levels of H_2S , NH_3 , methyl mercaptan, and various classes of carbonyl compounds. Omission of egg yolk increased whereas omission of egg white decreased H_2S content. Presence of non-fat milk solids, corn oil or lactic acid decreased H_2S content. Methyl mercaptan content was not significantly influenced by the formulation of the product. Omission of egg white decreased free NH_3 concn.; omission of yolk had no such effect. Omission of yolk or corn oil reduced levels of unsaturated carbonyls; omission of albumen or dried skim milk increased unsaturated carbonyls content. Omission of all constituents except liquid egg reduced unsaturated carbonyls content. Omission of egg white resulted in a 542% increase in saturated carbonyls concn. The H_2S and carbonyls may react, reducing the concn. of both. Cooked egg white had a stronger carbonyl-decreasing capacity than raw egg white. Dicarbonyls were the major class decreased by egg white; however, egg white was the major source of monocarbonyls. Yolk was an important source of generation of lower 2-enals and 2,4-dienals during cooking. AJDW

176

Egg and egg product flavor. [Review]

Maga, J. A.

Journal of Agricultural and Food Chemistry 30 (1) 9-14 (1982) [60 ref. En] [Dep. of Food Sci. & Nutr., Colorado State Univ., Fort Collins, Colorado 80523, USA]

Studies directly or indirectly concerning volatile compounds in eggs and egg products are reviewed. Volatiles present in whole eggs, yolks, whites, fermented eggs and dehydrated egg products are considered separately; formation of volatiles during heat treatment of eggs is discussed in most of these sections. Other aspects contributing to flavour and off-odour of eggs which are considered are feed effects, absorption of extraneous odours through egg shells and influence of storage and treatment of eggs for storage. In general it is concluded that no specific compounds have been identified that are responsible for characteristic egg flavour, and that objectionable flavours are usually related to components of hen feed (with some effect of breed). DIH

177

[Composition of volatile basic N in fish.] Über die Zusammensetzung des flüchtigen Basenstickstoffs in Fischen.

Oehlenschläger, J.; Rehbein, H.

Informationen für die Fischwirtschaft 29 (1) 33-34 (1982) [De] [Inst. für Biochem. & Tech., Hamburg, Federal Republic of Germany]

Use of total volatile basic N as an index of the freshness of fish is discussed; analytical factors influencing the result are considered. NH_3 was found to predominate throughout storage of cod in ice, although concn. of dimethylamine and trimethylamine increased during storage. The increase in total volatile basic N concn. was closely correlated with trimethylamine concn. ($r = 0.973$) and with NH_3 concn. ($r = 0.953$). Acid extracts of fish had higher NH_3 contents than steam distillates, showing that the distillation method does not quantitatively reflect the NH_3 concn. in the sample; diethylamine was also incompletely recovered by distillation. To minimize differences between analyses by different laboratories, it is suggested that a specific distillation vol. should be established for each fish type. AJDW

178

Relationship between volatile compounds in fat from forage- and grain-fed beef and sensory characteristics of steaks and roasts. [Lecture]

Hedrick, H. B.; Bailey, M. E.; Krouse, N. J.; Dupuy, H. P.; Legendre, M. G.

Proceedings of the European Meeting of Meat Research Workers No. 26, Vol. 1, F-15, pp. 307-310 (1980) [9 ref. En] [Univ. of Missouri, Columbia, Missouri, USA]

Angus \times Hereford steer calves, grazed on winter pasture + supplements up to mid-April, were then assigned to 3 diets: (i) fescue pasture for 6 months; (ii) fescue pasture for 3 months followed by fescue pasture + corn ad lib. for 5 months; and (iii) fescue pasture for 6 months, then corn ad lib. + protein supplement for 3 months. They were then slaughtered. Subcutaneous fat was analysed for volatiles by GLC; *longissimus* muscle steaks and *semimembranosus* roasts were

evaluated organoleptically. Volatiles present in fat from animals on the 3 regimes did not differ significantly; however, total volatiles concn. differed considerably, being greatest for (i), and slightly higher for (ii) than for (iii). Sensory properties of (i) meat were rated lower than those of (ii) and (iii) meats. (i) samples had flavour defects described as grassy, bitter and cow-like. Flavour and aroma of cooked fat was much more intense than that of cooked lean. Compounds probably responsible for the flavour defects include methylbenzaldehyde, naphthalene and 2,4-decadienal. [See FSTA (1982) 14 8S1379.] AJDW

179

Tracing of the changes in volatile monocarbonyls and lipid oxidation products in pork during the manufacture of canned ham. [Lecture]
Nestorov, N.; Gadzheva, D.; Baychev, I.; Gateva, A.
Proceedings of the European Meeting of Meat Research Workers No. 26, Vol. II, L-23, pp. 192-195 (1980) [17 ref. En] [Meat Tech. Res. Inst., Sofia, Bulgaria]

Studies were conducted on volatile monocarbonyls and lipid oxidation products in 'Rousse' canned ham at 4 stages of processing: (i) raw meat, (ii) cured meat, (iii) pasteurized product and (iv) sterilized product. Monocarbonyl concn. were higher in lean than in adipose tissue at all stages of processing, and increased in concn. from (i) to (iv). The ketone fraction of monocarbonyls was present at higher concn. and was more variable than the aldehyde fraction. Unsaturated carbonyls concn. increased as a result of heat treatment. All indices of lipid oxidation increased from (i) to (iv), the increase attributable to (iii) or (iv) being especially marked. [See FSTA (1982) 14 8S1379.] AJDW

180

Flavor of poultry meat - a review. [Review]
Ramaswamy, H. S.; Richards, J. F.
Canadian Institute of Food Science and Technology Journal 15 (1) 7-18 (1982) [128 ref. En, fr] [Dep. of Food Sci., Univ. of British Columbia, Vancouver, British Columbia V6T 2A2, Canada]

More than 250 chemical compounds have been identified in the volatiles of poultry meat and about 85 have been confirmed by 2 or more researchers. In 2 different approaches (sensory and chemical) the effect of feed, age and sex on poultry flavour, characterization of the volatile chemical compounds and their precursors, and the significance of pH in poultry flavour have been the subject matter of a number of investigations. Both S containing and carbonyl compounds are considered important in poultry flavour. S-amino acids and lipid materials are the major precursors of these compounds. This review brings together pertinent information available on poultry flavour research. AS

181

Synthesis of new pyrazines for flavor use.

Masuda, H.; Yoshida, M.; Shibamoto, T.

Journal of Agricultural and Food Chemistry 29 (5) 944-947 (1981) [21 ref. En] [Dep. of Environmental Toxicology, Univ. of California, Davis, California 95616, USA]

10 newly synthesized pyrazines, some of which possessed a liquorice-woody (isobutylquinoline-like) odour, showed very low odour thresholds (0.2-1.0 p.p.m. in an ethyl alcohol solution). This indicates that these pyrazines have high potential use as flavour ingredients. Eight 5-alkyl-3-methyl-2(1*H*)-pyrazinones were synthesized from 3-methyl-5,6-dihydro-2(1*H*)-pyrazinone, which was prepared from the reaction of methyl pyruvate and ethylenediamine, with aldehydes or ketones. Some pyrazinones synthesized were converted to 2-chloropyrazine derivatives, which were subsequently reacted with sodium alkylate, sodium phenolate, sodium thioalkylate, and sodium thiophenylate to obtain the desired alkoxy-, phenoxy-, (alkylthio)-, and (phenylthio)pyrazines, resp. The spectral data (IR; NMR; MS) of 8 pyrazinones and 10 new pyrazines are also reported. AS

182

Isolation and tentative identification of a new constituent of bourbon vanilla bean extract.

Feyertag, E.; Hutchins, R.

Food Chemistry 7 (4) 311-315 (1981) [5 ref. En] [Diexel Univ., Philadelphia, Pennsylvania 19104, USA]

Separation of a fragrant 5-piperidone compound, containing 3 methyl groups and also of methylbenzoate from bourbon vanilla bean extract was achieved by liquid chromatography and by gas-liquid partition chromatography, resp. AS

183

Effect of heating temperature and time on the volatile oxidative decomposition of linolenate.

Lomanno, S. S.; Nawar, W. W.

Journal of Food Science 47 (3) 744-746, 752 (1982) [En] [Dep. of Food Sci. & Nutr., Univ. of Massachusetts, Amherst, Massachusetts 01003, USA]

Ethyl linolenate was thermally oxidized at 70°, 180° and 250°C in a closed system in the presence of atmospheric oxygen. On the basis of the peroxide curve obtained at each of the 3 temp., 3 heating times were chosen for analysis of the volatile decomposition products. These products were identified by gas chromatography-MS. The qualitative pattern of the volatile decomposition products was the same for all treatments. 9 of the products were consistent with compounds predicted from cleavage of the conjugated linolenate hydroperoxides, with the C9 oxo-ester and the C8 ethyl ester produced in the largest amounts. Other predicted products were not detected and were hypothesized to undergo further degradations. Although the major effect of temp. was quantitative, it was difficult to relate the amounts of oxidation products directly to a temp.-dependent preferential hydroperoxide scission. IFT

184

Headspace gas chromatographic analysis of foods for volatile halocarbons.

Entz, R. C.; Hollifield, H. C.

Journal of Agricultural and Food Chemistry 30 (1) 84-88 (1982) [12 ref. En] [Div. of Chem. Tech., FDA, Washington, DC 20204, USA]

A headspace technique for determining volatile (b. p. < 150°C) halocarbons (VHC), such as chloroform, 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, and tetrachloroethylene, in foods was developed. Food samples were placed in a septum-capped vial, 20% H₂SO₄ was added to digest the sample, and water was added as a diluent. Some samples were analysed without preliminary treatment, depending upon the matrix. The vial was equilibrated at 90°C for 1 h. An aliquot of headspace was injected into a gas chromatograph equipped with an electron capture detector. VHC were detected at sub-ng/g levels in aqueous foods, while for lipid-containing matrices, detection limits were in the 10-50 ng/g range. By use of external standards or the method of standard additions, relative s.d. of ≤ 20% were achieved. Fish and several processed foods, including jelly, chocolate sauce, ice cream, and mayonnaise, were analysed using the headspace technique. AS

185

Flavor volatiles as measured by rapid instrumental techniques. [Lecture]

Legendre, M. G.; Dupuy, H. P.

ACS Symposium Series 147, 41-49 (1981) [23 ref. En] [Southern Reg. Res. Cent., USDA, PO Box 19687, New Orleans, Louisiana 70179, USA]

Rapid instrumental techniques were used to elucidate off-flavour problems in raw and processed rice products, raw and roasted peanuts, and corn-soy food blends. < 1 g of solid material was secured in a standard or special injection port liner of the gas chromatograph, the volatiles from the sample were steam distilled in situ and identified by combined GC/MS. This unconventional method can be used for eluting, resolving and identifying volatiles which may impart off-flavours in edible protein ingredients, and also provides information to resolve complex flavour problems for processors and plant breeders. [See FSTA (1982) 14 9A707.] AL

186

Effects of fermentation conditions and aging temperature on volatile ester contents in wine.

Shinohara, T.; Watanabe, M.

Agricultural and Biological Chemistry 45 (11) 2645-2651 (1981) [10 ref. En] [Cent. Res. Lab. of Kikkoman Corp., 399, Noda, Noda-shi, Chiba 270, Japan]

Effects were studied of a number of different fermentation conditions on content in finished wine of ethyl hexanoate, octanoate and decanoate, and isoamyl, hexyl and 2-phenylethyl acetates; effects of bottle ageing for 12 months at different temp. on contents of these compounds and diethyl succinate were also studied. Tabulated results show effects on volatile ester contents of the following variables: yeast strains (10 studied), must sugar contents (17-30% standard or

anaerobic fermentation conditions, must clarification, grape var. (5), SO₂ content (0-50, 100 mg/l), fermentation temp. (15°, 20°, 25°C), and ageing (5-25°C). Results show that for high contents of volatile esters to give good fruity flavour the following conditions are necessary: use of a selected yeast strain such as *Saccharomyces cerevisiae* var. *ellipsoideus*, well-matured grapes to give high sugar content in the must, anaerobic fermentation of clarified must and ageing at temp. < 20°C. DIH

187

[Threshold concentrations of fatty acid esters in beer.]

Voborsky, J.; Kahler, M.

Kvasny Prumysl 27 (7) 145-149 (1981) [23 ref. Cs, ru, en, de] [Vyzkumny Ustav Pivovarsky a Sladarsky, Prague, Czechoslovakia]

In spite of the beneficial effect of esters at certain concn. on beer taste and aroma, there is an adverse effect if the normal concn. level is exceeded. Contents of esters in various Czech beers were studied for several yr to establish threshold concn. The most important esters found in 12% alcohol beers can be arranged by importance (in descending order) as follows: ethyl butyrate, ethyl capronate, 3-methylbutyl acetate, ethyl caprylate, ethyl acetate. The last 3 are important, but if their concn. are above threshold values the beer will not be of a reasonable standard. STI

188

[Yeast fermentation products: alcoholic beverages and baking yeasts.]

Suomalainen, H.

Szeszipar 29 (4) 125-132 (1981) [Hu] [Inst. of the Finnish Alcohol Monopoly, Helsinki, Finland]

The gas chromatograms of aromatic substances present in Scotch whisky (produced both with yeast separated before distillation and distilled with yeast), cognac, rum, Spanish sherry (extra dry) and Finnish berry wine of sherry type are given. With reference to beer production, the development of diketones (α-aceto-α-hydroxybutyric acid → 2,3-pentanedione) in anaerobic fermentation is discussed. The chromatograms of S-compounds found in raw grain alcohol are also given. The amounts of fatty acid esters (isoamyl acetate, ethyl caproate, ethyl caprylate and ethyl caprate) produced by *Saccharomyces cerevisiae* and *S. uvarum* are cited, together with the hydrolysis of isoamylacetate and ethyl caprylate during the incubation of the esters with intact yeast cells. The gas chromatograms of yeast and yeast-free distillates, the amount of free sugars (glucose, fructose, sucrose, raffinose, maltose, and glucofructosans) present in wheat flour, and the changes occurring in the dough during fermentation and in the amount of maltose in yeast-free dough are quoted. Finally the baking yeast production of various countries is tabulated. ESK

189

[Gas chromatographic analysis of volatile beer aroma compounds using a multi-detection system.]

Die gaschromatographische Analyse leichtflüssiger Bieraromastoffe mit einem Multidetektionssystem. Seeleitner, G.; Liebl, M.

Brauwissenschaft 35 (2) 25-29 (1982) [11 ref. De, en, fr] [Versuchsst. für das Gärungsgewerbe,

Michaelerstrasse 25, A-1182 Vienna, Austria]

An automatic system for simultaneous GLC analysis of acetaldehyde, higher alcohols, esters, dimethyl sulphide, diacetyl and pentanedione in beer is described; these volatiles are separated by GLC on a Carbowax 400 capillary column (internal diam. 0.3 mm) equipped with 3 detector systems (flame photometric, electron capture and flame ionization) in series or parallel. Tables and chromatograms of results are given and discussed in detail, and optimization of analysis conditions is considered. Average relative s.d. of the results is $\pm 2-3\%$; higher s.d. are likely for dimethyl sulphide, especially at low concn. Advantages claimed for the system include lower capital cost than 3 separate analysis systems, low labour costs, and rapidity (analysis in only 11 min). AJDW

190

Sensory profile of wines, quality index.

Herraiz, M.; Cabezudo, M. D.

Process Biochemistry 16 (1) 16-19, 43 (1980/1981)

[33 ref. En] [Alcoholic Beverages Group, Inst. de Fermentaciones Ind., CSIC, Madrid, Spain]

22 samples of red wine from the Rioja area of Spain were analysed for volatile flavour components using the flavour profile method. Results were analysed using the Quality Index System and analysis of variance. Sensory results were compared with gas chromatographic data; in 17 of the 22 samples studied the conclusions reached through the 2 methods of assessment were the same. SP

191

[Chromatographic mass spectrometric analysis of volatile compounds in wine.]

Avakyants, S. P.; Rastyannikov, E. G.; Chernyaga, B. S.; Navrotskii, V. I.

Vinodelie i Vinogradarstvo SSSR No. 5, 50-53 (1981) [Ru] [VZIPP, USSR]

The aromatic substances were extracted from a wine sample by use of He, entrapped on a Tenax column, collected by thermal desorption, and the extract was passed to the gas chromatographic column. The separated substances were then identified by MS. A total of 76 compounds was identified in 8 kinds of wine and brandy. STI

192

[Analysis of citrus oils, with special reference to bergamot oil.] Analytik von Citrusölen unter besonderer Berücksichtigung der Bergamotöles.

Schenk, H. P.; Lamparsky, D.

Seifen-Öle-Fette-Wachse 107 (13) 365-369 (1981) [36 ref. De] [Givaudan AG, CH-8600 Dübendorf-Zürich, Switzerland]

Modern methods of analysis, especially capillary GLC with MS, allowed detection and identification of 143 components of bergamot oil, of which 77 were identified for the first time. Terpenoid components present in trace amounts, i.e. oxides, alcohols, bifunctional monoterpenes, esters, aldehydes, and sesquiterpenes, are discussed in some detail. RM

193

The effect of RidomilTM on the flavor of riced baked potatoes.

True, R. H.; Work, T. M.; Manzer, F. E.

American Potato Journal 59 (2) 65-67 (1982) [6 ref. En, es] [Dep. of Food Sci., Univ. of Maine, Orono, Maine 04469, USA]

Potato plants of var. Monona and var. Abnaki were treated with the systemic fungicide Ridomil at the rate of 0.375 lb active ingredient/acre; sprayed on a 14 day schedule. Potatoes were harvested Sept. 13, 1979 and were held at 7.1°C until tested in Nov. Baked Monona and Abnaki potatoes from the treated plants were compared with an untreated control of the respective var. by sensory panels of 13 and 18 members. TS contents of the control and treated samples were 20.14 and 19.93 g/100 g for Monona; 21.16 and 20.38 g/100 g for Abnaki. The difference was not significant within each var. The flavour of all samples was rated equal to the respective control sample and differences between the treatment means were not significant at the 5% level of detection. Results showed that the application of Ridomil at the above rate did not adversely affect the flavour or impair the quality of baked Monona or Abnaki potatoes. VJG

194

Formation of eight-carbon and ten-carbon components in mushrooms (*Agaricus campestris*).

Tressl, R.; Bahri, D.; Engel, K.-H.

Journal of Agricultural and Food Chemistry 30 (1) 89-93 (1982) [21 ref. En] [Forschungsinst. für Chemisch-technische Analyse, Tech. Univ. Berlin, D-1000 Berlin 65]

Formation of volatile C₈ components and less volatile C₁₀ (C₁₁) oxo and hydroxy acids was investigated in fresh mushrooms. Components were isolated from mushrooms by distillation-extraction and liquid-liquid extraction and analysed by capillary gas chromatography-MS. Further characterization was made by IR spectroscopy, ¹H NMR spectroscopy, chemical reactions, and trimethylsilyl derivatizations. After addition of linoleic and linolenic acids, the following components were identified for the first time in mushrooms: (Z)-2-octenal, (Z)-1,5-octadien-3-one, (Z)-1,5-octadien-3-ol, (Z,Z)-2,5-octadienal, and (Z,Z)-2,5-octadien-1-ol (partly showing intensive mushroom-like odours). 10-Oxodecanoic acid, 10-hydroxydecanoic acid, 10-oxoundecanoic acid, 10-hydroxyundecanoic acid, 10-oxo-8-decenoic acid, 10-hydroxy-8-decenoic acid, 9-oxodecanoic acid, and 9-hydroxydecanoic acid were characterized as enzymic products from linoleic acid. AS

195

[The aroma of *Boletus edulis*] Steimlitz Aroma (*Boletus edulis*)

Ney, K. H.; Freytag, W. G.

Gordian 80 (12) 304-305 (1980) [9 ref. De] [Unilever Forschungsgesellschaft mbH, Hamburg, Federal Republic of Germany]

Previously developed methods [see Ney, *Gordian* (1973) 73, 300] were used to investigate the volatile aroma components of dried *Boletus edulis*. Tabulated results showed the presence of 11 acids, 4 phenols, 8 amines, 10 alcohols, 1 ketone and 3 S-compounds. The main aroma component was found to be 1-octen-3-one. 1-octen-3-ol, was previously identified as a main aroma component in mushrooms [See *European Journal of Biochemistry* (1968) 4, 315] showing that the main aroma components of the 2 species differed only by substitution of a carbonyl for a hydroxyl group. RM

196

2-Acetyl-5-chloropyrrole in the volatile flavor constituents of cocoa butter.

Ho, C. T.; Jin, Q. Z.; Lee, K. N.; Carlin, J. T.

Journal of Agricultural and Food Chemistry 30 (2) 362-364 (1982) [11 ref. En] [Dep. of Food Sci., Cook Coll., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

Presence of 2-acetyl-5-chloropyrrole in the volatile flavour constituents of cocoa butter was confirmed through synthesis of the authentic compound. This compound was synthesized by chlorination of 2-acetylpyrrole. The structure of the synthesized compound was established by IR, NMR and mass spectrometry. Identification of this compound in the volatile flavour constituents of cocoa butter was confirmed by comparing the mass spectrum and gas chromatographic retention time with those of the authentic sample. 2-Acetyl-5-chloropyrrole is the first chlorinated heterocyclic compound identified in the volatile flavour of foods. AS

197

[Investigations on formation and occurrence of volatile nitrosamines in Danish cheese.]

Undersogelser over dannelse og forekomst af flygtige nitrosaminer i dansk ost. [Book]

Denmark, Proteinkemisk Institut; Denmark, Statens Forsogsmejeri; Denmark, Statens Levnedsmiddelinstitut

71pp. ISBN 87-503-3255-4 (1980) [41 ref. Da] Horsholm, Denmark [Venlighedsvej 4, DK 2970 Horsholm, Denmark]

Variations in normal techniques of manufacture, including the addition of nitrate, and storage had no effect on the content of volatile nitrosamines in Danish cheeses. 119 of 156 Danish cheese samples contained no detectable volatile nitrosamines. 34 contained traces (0.1-0.3 µg/kg) and only 3 contained more (0.6-0.7 µg/kg). Similar results were obtained for 19 samples of imported cheeses with 8 free from nitrosamines, 7 containing traces, 3 containing 0.6-1.0 µg/kg and 1 (Parmesan) containing 3.5 µg/kg [Also published in, En, ISBN 87-503-3257-0.] ADL

198

Assessment of egg flavor (odor) quality by unconventional gas chromatography.

Rayner, E. T.; Dupuy, H. P.; Legendre, M. G.; Schuller, W. H.; Holtbrook, D. M.

Poultry Science 59 (10) 2348-2351 (1980) [9 ref. En] [S. Reg. Res. Cent., New Orleans, Louisiana 70179, USA]

A direct GLC-MS method for analysis of flavour volatiles is described [see FSTA (1974) 6 2N55 (1977) 9 4N218 & (1978) 10 5N225]. Application of this method to assessment of flavour and odour quality of liquid egg products is considered, with reference to studies on samples of 'satisfactory', 'slightly sour' and 'sour' liquid egg. Chromatograms of 'sour' and 'satisfactory' samples are given. 'Slightly sour' liquid egg had higher concn. of ethanol, methyl propanol, diacetyl and 3-methylbutanal; 3-hydroxy-2-butanone is present in slightly sour egg, but not in satisfactory liquid egg. Sour egg shows a further increase in ethanol and 3-hydroxy-2-butanone concn., whereas methyl propanol and 3-methylbutanal concn. are markedly lower than in normal samples. AJDW

199

[Volatile components of smoked herring.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 47 (6) 783-786 (1981) [3 ref. Ja, en] [Notre Dame Seishin Univ., Okayama 700, Japan]

Head-space volatiles, steam-distilled volatiles, and volatiles in acid, phenol, and non-carbonyl neutral fractions of smoked and raw herrings were analysed by GLC and GC-MS and were identified by comparison of their mass spectra and retention times with those of authentic compounds. 48 volatile components (15 acids, 16 phenols, 3 carbonyls, 4 alcohols, 4 esters, 4 hydrocarbons, and 2 other components) from the smoked herring and 6 volatiles (1 acid and 5 hydrocarbons) from the raw herring were identified. The phenolic substances were the chief volatiles of smoked herring and were considered to come from the volatiles of wood smoke. On the other hand, the hydrocarbons in the volatiles of smoked herring seemed to come from fish flesh. AS

200

[Cooked odour of Antarctic krills. V. Effect of precooking.]

Kubota, K.; Kobayashi, A.; Yamanishi, T.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 28 (8) 457-460 (1981) [10 ref. Ja, en] [Lab. of Food Chem., Ochanomizu Univ., Bunkyo-ku, Tokyo, 112 Japan]

Cooked odour concentrates were obtained from pre-cooked frozen krills and raw frozen krills by simultaneous distillation and extraction. Individual fractions from preparative gas chromatograms were trapped and analysed by gas chromatography and MS. The control, i.e. raw concentrate, described as 'rancid and nutty', contained a large quantity of pyrazines, while the pre-cooked samples, having a dried fish like colour, contained a large quantity of S-containing compounds such as thialdines and trithiolanes, with small quantities of pyrazines. These differences were ascribed to the

different formation mechanisms which are influenced by the quantities of ammonia and free amino acids. [From En summ.][See FSTA (1981) 13 9R613 for earlier part.] JRR

201

Studies on the flavor substances of 'nori', the dried laver *Porphyra* spp. III. Sugars, organic acids and minerals of 'nori'.

Noda, H.; Amano, H.; Abo, K.; Horiguchi, Y. *Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi]* 47 (1) 57-62 (1981) [13 ref. En][Fac. of Fisheries, Mie Univ., Tsu, Mie 514, Japan]

8 commercial samples of 'nori' were extracted with 75% ethanol and the extracts were analysed for free sugars and organic acids by gas chromatography and for minerals by AAS. Isofloridoside and floridoside were the predominant free sugars, followed by glucose and galactose. A small amount of mannose, inositol, ribose, arabinose and xylose were also detected. The contents of these sugars were generally lower in nori products of good quality than in those of poor quality. Volatile and nonvolatile organic acids found in the extracts were formic, acetic, propionic, butyric, lactic, oxalic, malonic, fumaric, succinic, malic and citric acids. Among them, formic acid varied greatly from sample to sample. The contents of these organic acids were generally lower in tasty nori samples. Major cations found were Na^+ and K^+ , followed by Mg^{2+} and Ca^{2+} ; major anions were Cl^- and PO_4^{3-} . Nori produced from indoor cultured laver showed a general pattern similar to nori samples of poor quality as far as the above components are concerned. [See FSTA (1976) 8 10R584 for part II.] AS

202

Storage characteristics of brown shrimp (*Penaeus aztecus*) stored in retail packages containing CO_2 -enriched atmospheres.

Lannelongue, M.; Finne, G.; Hanna, M. O.; Nickelson, R.; Vanderzant, C. *Journal of Food Science* 47 (3) 911-913, 923 (1982) [En][Dep. Anim. Sci., Texas A&M Univ., 442 Kleberg Cent., College Station, Texas 77843, USA]

Use of modified atm containing CO_2 was effective in retarding microbial growth during refrigerated storage of retail packaged fresh brown shrimp. The inhibitory effect seemed proportional to the CO_2 tension. Surface pH of shrimp stored in air increased rapidly during the initial storage period, while a decrease in pH occurred in all samples stored in CO_2 -enriched atm. Shrimp stored in modified atm also had significantly lower total volatile N (TVN) values as compared to shrimp stored in air. Changes in the head-space composition were observed in all the atm. tested throughout the storage period, and were largest for shrimp stored in air. IFT

203

Gas chromatographic analysis of volatile sulphur-containing compounds of salted and salted-boiled pork.

Golovnya, R. V.; Garbuzov, V. G.; Grigoryeva, I. Ya.; Zharich, S.; Bolshakov, A. S.

Nahrung 26 (1) 89-96 (1981) [15 ref. En, de, ru][AN Nesmeyanov Inst. of Organo-Element Compounds, Moscow, USSR]

The qualitative composition and quantitative ratios of the volatile S-containing compounds (VSCC) in salted and salted-boiled pork were studied by gas chromatography using flame photometric detection. VSCC were isolated from the flavour condensate by treatment with mercuric chloride or extraction with diethyl ether. 27 VSCC were identified, including mercaptans, sulphides, polysulphides, heterocyclic compounds, as well as thioacid esters, with 12 of the compounds being detected in meat products for the first time. It has been established that thioacid esters appear in salted pork only after heat treatment, when qualitative and quantitative accumulation of VSCC occurs. AS

204

A rapid liquid-liquid extraction cleanup method for the determination of volatile N-nitrosamines in cooked-out bacon fat.

Sen, N. P.; Seaman, S. S.

Journal of Agricultural and Food Chemistry 30 (2) 364-367 (1982) [16 ref. En][Food Res. Div., Food Directorate, Health Protection Branch, Ottawa, Ontario, Canada K1A 0L2]

A rapid liquid-liquid extraction method is described for detn. of volatile nitrosamines in cooked-out bacon fat. The method consists of partitioning of the nitrosamines between *n*-hexane and an acidic aqueous-methanol mixture containing small amounts of sulphamic acid. An aliquot of the aqueous phase is then extracted with dichloromethane, the dichloromethane extract concentrated, and an aliquot of the concentrated extract analysed by a GLC-thermal energy analyser. Average % recoveries of *N*-nitrosodimethylamine, *N*-nitrosodiethylamine, *N*-nitrosopiperidine, *N*-nitrosopyrrolidine, and *N*-nitrosomorpholine when added to cooked-out bacon fat or lard at levels ranging between 5 and 20 ng/g were 78.8, 77.8, 89.4, 100.3, and 97.4, resp. The method has an overall detection limit of 1 ng/g for each of the above nitrosamines. Average levels (uncorrected) of *N*-nitrosodimethylamine and *N*-nitrosopyrrolidine detected in the 11 samples of cooked-out bacon fat were 4.8 and 21.1 ng/g, resp. AS

205

Flavor and selected chemical components of ground beef from steers backgrounded on pasture and fed corn up to 140 days.

Melton, S. L.; Black, J. M.; Davis, G. W.; Backus, W. R. *Journal of Food Science* 47 (3) 699-704 (1982) [En][Dep. of Food Tech. & Sci., Univ. of Tennessee, PO Box 1071, Knoxville, Tennessee 37901, USA]

Flavour and selected chemical components of ground beef from 60 steers were studied as a function of days (up to 140) that corn was fed to steers after grazing on pasture. During the 140 days on corn, significant changes occurred in the fatty acid composition of ground beef and in its carbohydrate content, titratable acidity, volatile fatty acid content, aroma and flavour. Flavour changes were related to certain chemical components. Results indicate that finishing cattle on corn for periods longer than 80-90 days caused little change in beef flavour. IFT

206

Supercritical fluids for extraction of flavors and fragrances from natural products. [Review]

Caragay, A. B.

Perfumer & Flavorist 6 (4) 43-46, 48, 51-55 (1981) [57 ref. En] [Arthur D. Little Inc., Cambridge, Massachusetts, USA]

This review describes the extraction of flavours and fragrances from natural products by supercritical fluids (i.e. fluid phase above the critical temp. and critical pressure (SCF)) with sections on nomenclature and SCF extractants, the attractiveness of CO₂ for extraction, solubility in SCF, a process schematic diagram, and applications (hop extraction, decaffeination of coffee and tea, extraction of flavours, spices, and essential oils). RM

207

Mass spectrometry. [Review]

Burlingame, A. L.; Dell, A.; Russell, D. H.

Analytical Chemistry 54 (5) 363R-409R (1982) [1304 ref. En] [Dep. of Pharmaceutical Chem., Univ. of California, San Francisco, California 94143, USA]

Literature on MS is reviewed under the headings of overview, scope, innovative techniques and instrumentation, chromatographic/MS/on-line computer techniques, MS/MS, unimolecular rate theory and molecular orbital calculations, thermochemical and kinetic studies, laser spectroscopy, metastable ions and ion structure, bimolecular ion chemistry, amino acids, complex antibiotics, carbohydrates, lipids, vitamins, biogenic amines, eicosanoids, purines and nucleosides etc., miscellaneous compounds, human and other biological toxic environmental exposure, and organic geochemistry. AL

208

[Importance of sensory evaluation in flavour analysis.] Bedeutung der Sensorik in der Flavouranalytik.

Einhoff, K.

Deutsche Milchwirtschaft 32 (36) 1344-1348 (1981) [14 ref. De] [Bundesanstalt für Milchwirtschaft, Kiel, Federal Republic of Germany]

This paper deals in detail with procedures of sensory evaluation of food aroma, and compares them with GLC examination. It is concluded that though GLC can present a very detailed picture of aroma compounds and their changes, it is incapable of assessing their sensory impact on odour and taste, and that sensory evaluation has the further advantage of speed and ease of execution. SKK

209

Allyl hexanoate gas chromatographic method, headspace technique. Recommended method 16 (1980).

International Organization of the Flavor Industry *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 174 (5) 395 (1982) [En] [8, Rue Charles-Humber, CH-1205 Geneva, Switzerland]

Recommended method for detn. of allyl hexanoate in pineapple juice, confectionery, dairy products and desserts involves equilibration of the prepared sample with the vapour phase over it and analysis of the vapour phase by GLC, using a 20-30% SE30 on Chromosorb W 80-100 mesh column, with flame ionization detection. Limit of detection is 5 p.p.m. DIH

210

Analytical procedure for a general method for gas chromatography on capillary columns.

International Organization of the Flavor Industry *Zeitschrift für Lebensmittel-Untersuchung und -Forschung* 174 (5) 399-400 (1982) [En] [8, Rue Charles-Humbert, CH-1205 Geneva, Switzerland]

General principles and procedures are given for detn. of quantitative amounts of specific flavour components in foods and for detn. of flavour component profiles by means of capillary gas chromatography. DIH

211

[Sensory properties of the *cis-trans* isomers of 3,5-di-n-alkyl-1,2,4-trithiolanes.] Sensorische Eigenschaften der *cis/trans*-Isomeren von 3,5-Di-n-alkyl-1,2,4-trithiolanen.

Rödel, W.; Kruse, H.-P.

Nahrung 26 (4) 377-383 (1982) [12 ref. De, en, ru] [Zentralinst. für Ernährung, Potsdam-Rehbrücke, German Democratic Republic]

3,5-di-n-alkyl-1,2,4-trithiolanes (methyl to n-heptyl) were synthesized, and the *cis* and *trans*-isomers were separated by HPLC. Flavour characteristics of the various members of the homologous series were evaluated. The lower members of the series had predominantly Allium-like flavours; a wide range of flavours were reported for the higher members of the series. Threshold values were calculated. *Cis* and *trans* isomers differed in sensory characteristics. IN

212

[Analysis of aroma compounds in food chemistry.] Aromastoffanalyse in der lebensmittelchemischen Praxis.

Pfannhauser, W.; Eberhardt, R.; Woidich, H.

Ernährung 6 (3) 107-110 (1982) [De, en] [Forschungsinst. der Ernährungswirtschaft, Blaasstrasse 29, A-1190 Vienna, Austria]

The solution of problems arising in the analysis of aromas in foods is described using 4 examples. The problems are: off-flavours in chocolate-coated long bakery products (resulting from solvent residues in the packaging) and in cheese (presence of a thiophene derivative in the wax seal); absence of orange juice in an orange beverage; and addition of cedar oil to aromatise a raspberry ice cream base. Extraction procedures and gas chromatography/MS conditions are also given. RAW

213

Studies on flavor components of roasted chicory root. Sannai, A.; Fujimori, T.; Kato, K.

Agricultural and Biological Chemistry 46 (2) 429-433 (1982) [9 ref. En] [Fuji Flavour Co., Ltd., Midorigaoka 3-5-8, Hamura-machi, Nishitama-gun, Tokyo 190-11, Japan]

A commercial 50%-ethanol extract of roasted chicory root was steam-distilled, and the steam-volatile components were analysed by GLC-MS; a dichloromethane extract of air-dried chicory root was similarly treated for comparison. GLC column was Chromosorb W (AW-DMCS) 60-80 mesh coated with 5% FFAP. The gas chromatogram of the roasted chicory volatiles contained 42 peaks, 32 of which were identified, 23 for the 1st time as chicory root constituents. The gas chromatogram of the air-dried root components contained 13 peaks, 8 of which were identified; these were chiefly fatty acids, especially palmitic (60.2%) and linoleic (31.5%). Most abundant non-fatty acid compound in air-dried root was benzothiazole (0.7%). The fatty acids identified in air-dried root were, along with their methyl esters, also aroma components of roasted root; methyl linoleate (7.45%) and linoleic acid (6.74%) were the chief constituents. Other major components were vanillin (5.48%), 5-hydroxymethyl-2-furfural (4.27%), 2-acetylpyrole (3.77%), furfural (2.80%), phenylacetic acid (2.49%), 2-(5-hydroxymethyl-2-formylpyrrol-1-yl)-3-methylpentanoic acid lactone (1.4%) and phenylacetaldehyde (1.04%). DIH

214

[Hop quality today. Development and trends.]

Hopfenqualität heute. Entwicklung und Trends.

Maier, J.

Brauwelt 122 (11) 435-440 (1982) [7 ref. De, en, fr]

[Hans-Pfülf-Inst. für Hopfenforschung, Hüll/Obb., Federal Republic of Germany]

Aspects considered include: external condition: bitter principles; essential oil; aroma constituents in relation to var.; classification of var.; brewing value in relation to hop aroma; biological value of hops; changes in the hop industry; and testing of quality characteristics. Data are given for bitter principles and aromatic material contents of the new var. Perle in comparison to the established var. Hallertauer Mittelfrüh, Hersbrucker Spät und Northern Brewer. AJDW

215

[Chemical analysis of aromatic components on semi-fermented tea (oolong and pouchung teas).]

Takeo, T.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 28 (4) 176-180 (1981) [17 ref. Ja, en] [Nat. Res. Inst. of Tea, Kanaya-cho, Haibara-gun, Shizuoka-ken, 428 Japan]

The volatile aroma components obtained from semi-fermented teas were analysed by gas chromatography-MS. Terpene alcohols and their oxides, benzyl alcohol, phenylethanol and indole were identified as the main aroma components, the total amount of which was higher in the higher quality teas. Most of the aroma compounds arose from enzymic breakdown of non-volatiles during fermentation. The pattern of aroma components differed between var. of tea used. [From En summ.] JRR

216

[Study of essential oils in several grape varieties during ripening.]

Egorov, I. A.; Rodopulo, A. K.; Bezzubov, A. A.;

Skipnik, A. Yu.; Nechaev, L. N.

Prikladnaya Biokhimiya i Mikrobiologiya 14 (1) 135-139 (1978) [4 ref. Ru, en] [Inst. Biokhimii im. A. N. Bakha AN SSSR, Moscow, USSR]

Changes in the content of essential oils in fresh grapes of var. (i) Riesling (white) and (ii) Cabernet (red) during ripening were studied. Chromatograms and tabulated data are presented for contents of essential oils, esters, terpenoids and alcohols in grape juice of (i) and (ii). Total essential oils in juice increased during ripening from 44.3 to 69.5 and from 58.7 to 116.8 mg/kg in (i) and (ii), resp. Total esters increased from 17.8 to 22.5 and from 26.8 to 61.9 mg/kg in (i) and (iii), resp.; for (ii), this increase was mainly due to increased ethyl capronate, β -phenyl ethyl capronate and ethyl linoleate. Increase in total alcohols, from 16.2 to 37.3 mg/kg in (i) and from 23.2 to 43.5 mg/kg in (ii), was mainly due to β -phenyl ethanol. Terpenoids content decreased in juice of (i) from 10.6 to 9.7, but increased in juice of (ii) from 9.3 to 15.9 mg/kg. For (i) the amount of essential oils was max. during technical maturity and decreased during physiological maturity, whereas for (ii) the amount increased continuously. It was concluded that (i) should be harvested during technical maturity and (ii) during physiological maturity. RAW

217

[Analytical differentiation between 'musty' and 'corky' flavours of wine.] Zur analytischen

Differenzierung von Muffton und Korkgeschmack.

Tanner, H.; Zanier, C.; Würdig, G.

Weinwirtschaft 118 (1) 15-16 (1982) [9 ref. De] [Eidg. Forschungsanstalt, Wädenswil, Switzerland]

GLC-MS studies on samples of wines showing a characteristic 'musty' off-flavour revealed the presence of pentachloroanisole at concn. of 4-11 parts/trillion and 2,3,4,6-tetrachloroanisole at a concn. of 5-12 parts/trillion. The latter has a very low sensory threshold value, and is the main component responsible for the musty off-flavour. It is derived from barrels made from wood treated with the preservative Raco, which contains tetrachlorophenol as an impurity. This is converted to the corresponding anisoles by microbial action. 2,4,6-trichloroanisole, the compound responsible for 'corky' off-flavour, was present only at insignificant concn. (< 1 part/trillion). AJDW

218

[Study (using GLC) of volatile phenol compounds in white table wines.]

Dzhakhua, M. Ya.; Drboglav, E. S.; Dzhaparidze, M. A.

Prikladnaya Biokhimiya i Mikrobiologiya 14 (1) 156-158 (1978) [4 ref. Ru, en] [Vses. Zochnyi Inst. Pishchevoi Promyshlennosti, Moscow, USSR]

219

[Development of volatile compounds during manufacture of sparkling wines in Trentino.]

Versini, G.; Margheri, G.

Industria delle Bevande No. 58, 101-109 (1982) [19 ref. It.] [Istituto Agrario Prov., Lab. di Analisi e di Ricerca, San Michele all'Adige, Trento, Italy]

Tests were carried out on the basic wines for Trentino sparkling wine production, viz. Chardonnay, Pinot Bianco and Pinot Nero, to determine the volatile constituents contributing to the bouquet of the end product. Gas chromatography (FFAP capillary column, 60 m length, 0.3 mm diam.) revealed a total of 43 compounds (36 samples analysed, results tabulated for

min., max. and mean values), the relative importance of which is briefly discussed. Additionally, changes occurring in some of the major volatile constituents (acetates, fatty acid ethyl esters, fatty acids) during fermentation of the wine in bottles or autoclaves are outlined. Considerable differences were observed in the fermentation patterns, as shown in a series of graphs; the potential significance of these differences is also discussed. Finally, changes occurring in the major volatile constituents during ageing of sparkling Trentino wines made by the Champenois method are tabulated and compared with the same constituents in the basic wines. HB

220

Non-bitter hop contributions to beer flavor. [Lecture]

Peacock, V.; Deinzer, M.

ACS Symposium Series 170, 119-127 (1981) [19 ref. En] [Dep. of Agric. Chem., Oregon State Univ., Corvallis, Oregon 97331, USA]

The structure of 12 components of hop oil is given, and 14 hop constituents known to occur in beer are tabulated in parts/billion. A major constituent is linalool, while geraniol and geranyl isobutyrate are believed to be responsible for the intense 'floral' aroma of beer brewed with Cascade hops, but different individuals vary widely in their ability to detect geraniol or geranyl isobutyrate. Tabulations are given of the linalool, geraniol and geranyl isobutyrate contents of various hop var. The influence of hop storage and long boiling times is considered. [See FSTA (1982) 14 10]1502.] ELC

221

Gas chromatographic analysis of volatile esters in wines.

Shinohara, T.; Watanabe, M.

Agricultural and Biological Chemistry 45 (12) 2903-2905 (1981) [14 ref. En] [Cent. Res. Lab. of Kikkoman Corp., 399, Noda, Noda-shi, Chiba 278, Japan]

Volatile esters were extracted from wines by extraction with pentane (or ethyl acetate/pentane 2:1 to extract 2-phenylethyl acetate) and were determined by GLC on Chromosorb W A W 60-80 mesh coated with PEG600, PEG1000 or EGSP, depending on ester being analysed. Tabulated data give means and ranges of contents of ethyl hexanoate, octanoate and decanoate, isoamyl, hexyl and 2-phenylethyl acetates, and diethyl succinate (DES) in 24 Japanese wines (10 white, 4 rose, 10 red), 20 foreign wines (10 white, 3 rose, 7 red), 4 sparkling wines and 5 sherries. These results are for

commercial wines; table wines contained mean levels of 0.1-0.6 mg/l of each ethyl ester, 0.2-1.1 mg isoamyl acetate/l, traces of the other acetates and 9-20 mg DES/l. Sparkling wines were broadly similar to table wines. Sherries had high DES contents (49-66 mg/l) but only traces of the other esters. Contents of esters are tabulated for 7 new Japanese wines (aged for 1 yr in bottle or cellar); these new wines had higher ethyl and acetate ester concn. than did the general commercial samples. This was especially marked for isoamyl acetate, being 0.6-2.7 mg/l in new wines. Contribution of individual esters to wine aroma is assessed by tabulating the ranges of odour values (concn./aroma threshold value) found in the commercial wines; ethyl hexanoate and octanoate and isoamyl acetate would be expected to contribute to wine aroma; the other esters were present at concn. lower than their threshold values. DIH

222

[Composition of marc brandies and the need for revision of the appropriate standards.]

Tandoi Scopigno, P.; Stacchini, A.

Rivista della Società Italiana di Scienza dell'Alimentazione 10 (2) 125-128 (1981) [11 ref. It, en] [Lab. Alimenti, Istituto Superiore di Sanita, Rome, Italy]

Current Italian legislation for marc brandy (grappa) is critically discussed, with reference to requirements concerning raw materials, identity of the product, and levels of various constituents. GLC analyses of volatiles in 18 samples from Lombardy, 11 from Piedmont, 54 from Trentino and 31 from Venice are presented, data being given for methanol, 2-propanol, 1-propanol, iso-butanol, 1-butanol, 2-butanol, total esters and total aldehydes. Establishment of legal limits for these volatiles is considered, with reference to quality and authenticity of the brandies, and toxicological characteristics of the volatiles. AIDW

223

[Flavour change during ageing of sake. XX. Analysis of volatile sulphur compounds with high- and medium-boiling point in sake.]

Kitamoto, K.; Oba, T.; Namba, Y.

Journal of the Society of Brewing, Japan [Nihon Jozo Kyokai Zasshi] 76 (7) 487-490 (1981) [16 ref. Ja] [Nat. Res. Inst. of Brewing, Kita-ku, Tokyo, Japan]

S-compounds with high and medium b.p. found in sake were analysed by gas chromatography using a flame photodetector. 8 peaks were detected in the concentrate of the CHCl₃ extract of fresh sake, 1 of which was identified as methanol. [See FSTA (1979) 11 10H1709 for part XIX.] YN

224

[Volatile components of cider and dessert apples.]

Saura Calixto, F.; Bermejo, J.

Anales de Bromatologia 32 (3) 281-288 (1980) [34 ref. Es, en] [Univ. de Palma de Mallorca, Palma de Mallorca, Spain]

GLC analysis of the volatile components of cider apples allowed the identification of about 100 different components. The literature on new substances found in apple aroma between 1966 and 1980 was reviewed and used to compare cider and dessert apples. Tabulated

data showed that the volatile fraction of cider apples contained 49.4% total alcohols, 36.0% total esters and 11.2% total carbonyl compounds. It contained a higher % of esters than that of dessert apples, and more long-chain esters (C10 and higher). RM

225

Raisin and dried fig volatile components: possible insect attractants. [Lecture]

Buttery, R. G.; Seifert, R. M.; Ling, L. C.; Soderstrom, E. I.; Yerington, A. P.

ACS Symposium Series 170, 29-41 (1981) [11 ref. En] [W. Reg. Res. Lab., SEA, USDA, Berkeley, California 94710, USA]

Volatile oils were obtained by vacuum steam distillation from good quality dried raisins (dried Thompson seedless grapes) and dried and fresh figs (*Calimyrna* var.) and analysed by capillary GLC-MS. A total of 38 components were identified in the volatile oil of raisins and 34 in the volatile oil of dried figs; tables of data are given. Major volatile components in both included fatty acid degradation products such as nonanoic and octanoic acids, (*E*)-2-octenal and nonanal. In dried figs an additional major component was benzaldehyde. The most unusual components were 2-hexyl-3-methyl-maleic anhydride and 1-octen-3-one in raisin volatile oil. Studies to identify the volatile odour components of raisins and dried figs which attract insect pests e.g. the Indian meal moth (*Plodia interpunctella*) and saw tooth grain beetle (*Oryzaephilus surinamensis*), have been started but no reportable results have yet been obtained. Work on *Drosophila* spp. attraction to figs during ripening in the orchard is also reported. [See FSTA (1982) 14 10]1502.] AL

226

Volatile constituents of pumpkins. [Lecture]

Parliment, T. H.; Kolor, M. G.; Rizzo, D. J.; Herzing-Giordano, D.

ACS Symposium Series 170, 129-136 (1981) [10 ref. En] [General Foods Corp., Tech. Cent. 250 North St., White Plains, New York, USA]

The major volatile compounds of freshly cooked pumpkins were compared with those of commercially canned pumpkins. Fresh pumpkins were homogenized, heated under reflux for 3 h, extracted with diethyl ether and concentrated; canned pumpkin was combined with water and then treated similarly. Analyses were performed by GLC and MS. Major components of fresh vs. canned pumpkin are presented together with gas chromatograms. The fresh fruit contained >70% of 6-carbon alcohols and aldehydes, while 9-carbon compounds were absent. Major changes occurred in canned pumpkin; practically all the 6-carbon compounds were lost, accompanied by a considerable increase in furfural and the appearance of 2-methyl tetrahydrofuran-3-one. This and other possible sugar-amino acid reactions is attributed to extended processing times at 250°F. Both pumpkins, fresh or canned, contained practically no esters. [See FSTA (1982) 14 10]1502.] ELC

227

Volatiles from red pepper (*Capsicum* spp.). [Lecture]

Keller, U.; Flath, R. A.; Mon, T. R.; Teranishi, R.

ACS Symposium Series 170, 137-146 (1981) [20 ref. En] [Firmenich SA, Geneva, Switzerland]

Volatiles from red pepper (*Capsicum annuum* and *C. frutescens*) were isolated by steam distillation-solvent extraction methods. The botanical spp. *Capsicum frutescens* is normally smaller with a 'hot' flavour, while *C. annuum* tends to be larger with a milder flavour (sweet chillies). Volatile concentrates were fractionated and examined by GLC-MS; they included 17 alcohols, 20 carbonyl compounds, 14 carboxylic acids, 21 esters, 6 pyrazines, 14 terpene hydrocarbons and 10 miscellaneous compounds. The major compounds in 'hot' fruit are capsaicin, dihydrocapsaicin and nordihydrocapsaicin, present as free acids or methyl esters. Sweet chillies were examined in more detail; fractions obtained were neutral material (mainly monoterpene hydrocarbons), an acidic fraction (mainly lower aliphatic acids and particularly 2-methylpropionic acid), and a basic pyrazine fraction which also contributes to odour. However, no odour characteristic of various fractions could be fully correlated with the constituents identified. [See FSTA (1982) 14 10]1502.] ELC

228

Peanut quality: its relationship to volatile compounds - a review. [Lecture]

Pattee, H. E.; Singleton, J. A.

ACS Symposium Series 170, 147-161 (1981) [72 ref. En] [USDA, SEA, AR, Mid-Atlantic Area & Dep. of Botany, N. Carolina State Univ., Raleigh, N. Carolina 27650, USA]

This review of volatile compounds in relation to peanut quality covers several aspects. Off-flavours due to high temp. curing (max. 35-38°C) are due primarily to acetaldehyde, ethanol and ethyl acetate. Extensive work on the volatiles of 'normal flavoured' peanuts suggests that hexanal and octanal are significant contributors, although storage factors and blanching methods can have considerable effects. The effect of enzymes, and particularly lipoxygenase, in the production of flavour volatiles, together with the characteristics of peanut lipoxygenase, is discussed in detail. Other topics discussed include the complicated changes which occur during the roasting of peanuts. Genetic factors still require investigation, and also the effects of farm storage and marketing practices. [See FSTA (1982) 14 10]1502.] ELC

229

Instrumental and sensory characteristics of roasted peanut flavor volatiles. [Lecture]

Buckholz, L. L., Jr.; Daun, H.

ACS Symposium Series 170, 163-181 (1981) [46 ref. En] [Int. Flavors & Fragrances, 1515 Highway 3b, Union Beach, New Jersey 07735, USA]

The aroma of fresh roasted peanuts depends on the roasting time at 130-150°C and reflects changes in the ratio of carbonyl derivatives to pyrazines. About 300 flavour compounds have now been identified in roasted peanuts, the most important constituents being amino acids, sugars, proteins and lipids. It is concluded

that a decrease in carbonyls (which impart a 'harsh', 'green' aroma) and an increase in pyrazines (which contribute a roasted, nutty aroma) is important for good peanut flavour. It is necessary to correlate instrumental with sensory data. Peanuts can be rated by 4 sensory attributes i.e. strength and desirability of aroma and flavour; taste panels agreed in respect of intensity but not desirability. [See FSTA (1982) 14 10]1502.] ELC

230

Chaotropic ions in activation and protection of γ -glutamyltransferase from fruiting bodies of *Lentinus edodes*.

Iwami, K.; Yasumoto, K.

Agricultural and Biological Chemistry 46 (3) 761-765 (1982) [13 ref. En] [Dep. of Food Sci. & Tech., Kyoto Univ., Sakyo-ku, Kyoto 606, Japan]

Effects of chaotropes were studied on the γ -glutamyltransferase (EC 2.3.2.2) from shiitake mushroom (*L. edodes*), an anion-dependent enzyme involved in formation of the characteristic aroma compound lenthionine from a γ -glutamyl peptide. Monovalent chaotropic anions were studied; of these SCN^- appeared to differ in its mode of action, decreasing K_m for the substrate but not affecting V_{max} , whereas the other ions increased V_{max} but did not affect K_m . Thiocyanate ion also differed from the other chaotropic ions in protection of the enzyme against inhibitors such as *N*-ethylmaleimide. DIH

231

Contents and compositions of the aroma in "Wasanbon" sugar.

Matsui, T.; Kitaoka, S.

Journal of Nutritional Science and Vitaminology 27 (6) 563-572 (1981) [8 ref. En] [Dep. of Food Sci., Kagawa Univ., Miki-cho, Kagawa 761-07, Japan]

Studies on the aroma compounds present in "Wasanbon" a Japanese hand-made sugar, and intermediate products in its manufacture are described. Samples of first press-off molasses, refinery final molasses, pre-refined sugar, and finished wasanbon sugar were studied by column chromatography, GLC, MS and sensory evaluation. Tables of results are given. Major aroma compounds in the acidic fraction of refinery final molasses and wasanbon sugar included ethyl caproate, methyl benzoate, β -phenethyl alcohol, methyl phenylacetate, isopropyl benzoate, ethyl phenylacetate, methyl 3-phenylpropionate and butyl benzoate; the weakly acidic fraction contained furfuryl alcohol, δ -valerolactone, acetylfuran, cyclotene, guaiacol and maltol. Organoleptic evaluation suggested that cyclotene, maltol, acetylfuran and δ -valerolactone were the major aroma compounds in wasanbon sugar. AJDW

232

[Volatile components in the aroma of virgin olive oil. V. Oils obtained from 'atrojado' fruits.]

Gutierrez, R.; Dobarganes, M. C.; Gutierrez, F.; Olias, J. M.

Grasas y Aceites 32 (5) 299-303 (1981) [10 ref. Es, en, fr] [Inst. de la Grasa y sus Derivados, Seville, Spain]

The previously described method [see FSTA (1982) 14 6N310] was used to separate and identify volatile components of oil from 'atrojado' [withered] olives; i.e. GLC-MS, with elution by 3 solvents of increasing polarity. Tabulated results show the composition of the hydrocarbon, the carbonyl and ester, and the alcohol fractions. Collating results of chemical and sensory analysis, it was observed that the fruit suffered from over-ripening, pronounced oxidation of unsaturated fatty acids and severe attack by fungi and bacteria; the last factor was the chief culprit responsible for the sensory defects. RM

233

[Analysis of rapeseed oils by gas chromatography and mass spectrometry.]

Lorusso, S.; Boniforti, L.; Selva, A.; Chiacchierini, E. *Rivista della Societa Italiana di Scienza dell'Alimentazione* 10 (2) 93-100 (1981) [39 ref. It] [Inst. di Merceologia, Univ. di Roma, Rome, Italy]

Capillary-column gas chromatography-MS studies on samples of rapeseed oil from 9 rapeseed var., and of 3 commercial samples of rapeseed oil, are described; a table of results is given, showing concn. of C16:0, C16:1, C18:0, C18:1, C18:2, C18:3, C20:0, C20:1, C21:0, C22:0 and C22:1 acids. Considerable variations in fatty acid composition were observed. Positional isomers of gadoleic and erucic acids were identified. Data are also presented for density, refractive index and I value of the oils. AJDW

234

Ripening changes in Cephalotyre 'Ras' cheese slurries.

Abdel-Baky, A. A.; El-Neshewy, A.; Rabie, A. H. M.; Farahat, S. M.

Journal of Dairy Research 49 (2) 337-341 (1982) [14 ref. En] [Food Sci. Dep., Zagazig Univ., Egypt]

Cephalotyre (Ras) cheese slurries developed within 7 days at 30°C a flavour similar to that of conventional Ras cheese ripened for 2 months. Addition of a proteinase/lipase mixture, trace elements or sodium citrate to fresh cheese slurries before storage at 30°C enhanced flavour development. After storage for 5 days at 30°C additive-treated slurries showed a strong flavour similar to that of 3-4 months Ras cheese with increased protein degradation, acidity development, volatile fatty acid formation and higher bacterial counts. Effectiveness of the additives in enhancing flavour development and related chemical changes was in the order: proteinase/lipase mixture > trace elements > sodium citrate. AS

235

[Effect of UHT treatment and storage of milk on its content of volatile acids.]

Tylkin, V. B.; Tsaberyabaya, N. I.

Tovarovedenie 14, 35-37 (1981) [4 ref. Ru]

Contents of volatile acids determined by GLC in raw milk and in milk after UHT treatment were resp. (mg/100 g): formic 0.24 and 0.94, acetic 0.32 and 2.68, butyric 0 and 0.20, propionic 0 and 0.18, and pyruvic 0 and 0.35. Tabulated data on contents of these acids in UHT milk stored for up to 6 months showed progressive increase in all; values for the 5 acids at 3 months were resp. 2.85, 5.12, 2.25, 1.24 and 1.20 mg/100 g; at 6 months, they were 6.20, 8.62, 6.98, 2.19 and 2.54. It is considered that at total contents of > 12-15 mg/100 g, volatile acids would impair the quality of stored UHT milk. SKK

236

Key factors in 'katsuobushi' (dried bonito) aroma formation.

Imai, H.; Aishima, T.; Nobuhara, A.

Agricultural and Biological Chemistry 46 (2) 419-428 (1982) [20 ref. En] [Cent. Res. Lab., Kikkoman Corp., 399 Noda, Noda-shi, Chiba 278, Japan]

The necessary factors for making the characteristic aroma of katsuobushi were investigated. The aromas, obtained from various heat treatments of several materials, were compared with the aroma of katsuobushi using a sensory test, pattern similarity analysis of GC profiles and GC-MS data. The oil and meat of bonito and the smoking process were considered significant among several factors in the katsuobushi manufacturing process. However extracted residue and oil of katsuobushi, i. e. the protein-rich and oil fractions, contained only a trace of katsuobushi aroma, the mixture of these two materials had a katsuobushi-like aroma after heating with smoke oil as a substitute for the smoking process. The similarity in the aroma qualities between the obtained katsuobushi-like and genuine katsuobushi aromas was confirmed by comparing the aroma components and GC profiles of both aromas. AS

237

[Volatile components of rice bran-fermented sardine.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 47 (1) 121-125 (1981) [1 ref. Ja, en] [Notre Dame Seishin Univ., Okayama 700, Japan]

Volatile components of rice bran-fermented (RBF) sardine and raw sardine were studied by GLC and GC-MS analyses. 40 components (9 acids, 3 bases, 1 phenol, 7 carbonyls, 5 alcohols, 7 esters, and 8 hydrocarbons) from RBF sardine and 18 components (1 acid, 3 bases, 1 alcohol, 1 ester and 12 hydrocarbons) from raw sardine were identified. Hydrocarbons and bases in RBF sardine seemed to be derived from sardine itself, because these components were detected from raw sardine too. Most of the other volatile components of RBF sardine were considered to be formed by the fermentation and change of components in sardine meat, and seemed to mask the odour specific to sardine. AS

238

Perfumery and flavor materials. [Review]

Bedoukian, P. Z.

Perfumer & Flavorist 6 (2) 1, 3-6, 8-10, 12-14, 16-17, 19-23 (1981) [234 ref. En] [Bedoukian Res. Inc., Danbury, Connecticut, USA]

Bedoukian's 37th annual review includes notes on the last year's research in terpenes and sesquiterpenes, research in aroma chemicals, research in flavours (fruit flavours, tea flavours, orange juice, potato flavour, cereal flavour, cheese flavour, onion flavours, meat flavour, and flavours of honey, white sauce for fish dishes, soy sauce, smoked salmon and mushrooms), and lists reviews and books of interest. RM

239

[Flavour enhancers.] Geschmacksverstärker. [Review]

Oberdieck, R.

Fleischwirtschaft 61 (2) 216-223; 254 (1981) [many ref. De, en] [Raps & Co. Gewürzwerk, Adalbeit-Raps-Strasse, D-8650 Kulmbach, Federal Republic of Germany]

This review discusses the sense of taste, the compounds acting on it and those reinforcing basic taste sensations. The chemistry and food uses of a number of flavour enhancers are reviewed and structural formulae given. RM

240

Progress in essential oils.

Lawrence, B. M.

Perfumer & Flavorist 6 (2) 59-63 (1981) [many ref. En]

The series is continued with notes and references on cassia oil, fennel oil, genet absolute (*Spartium junceum*), laurel leaf oil, peppermint oil, Roman chamomile oil (*Anthemis nobilis* L.) and wormwood oil (*Artemisia absinthum* L.). [See FSTA (1981) 13 8T464 for previous part.] RM

241

[Comparison of bergamot essential oil from Italy, Corsica and Ivory Coast.]

Huet, R.

Fruits 36 (6) 385-393 (1981) [15 ref. Fr, es, en, de, ru] [GERDAT-IRFA, BP 5035, 34032 Montpellier Cedex, France]

Samples of bergamot essential oil from Italy, Corsica and the Ivory Coast were compared. Tabulated data for physico-chemical and chemical (GLC) analysis reveal the existence of 2 types, Mediterranean and Ivorian, differing in the quantity of terpene compounds, α - and β -pinenes, sabinene and γ -terpinene, the presence of 2 unidentified components in the Mediterranean type, linalool content, UV spectrum, and olfactive quality. RM

242

[Analysis of essential oils. Ten years essential oil research 1969-1979.] Zur Analytik ätherischer Öle.

Zehn Jahre Ätherische-Öle-Forschung 1969 bis 1979. [Review]

Scheffer, J. J. C.; Baerheim Svendsen, A.

Kiechstoffe, Aromen, Kosmetica 31 (2) 39-41 (1981) [24 ref. De, en][Univ. Leiden, Leiden, Netherlands]

The development of essential oil research in the last decade is reviewed, with special reference to chromatographic methods. RM

243

[A mint of the 'viridis' group: *Mentha crispata* Schrader. Botanical and chemical studies.]

Gallino, M.; Codignola, A.

Essenze Derivati Agrumari 50 (2) 79-85 (1980) [4 ref. It][Univ. di Torino, Turin, Italy]

A mint from the botanical garden of Montpellier was studied for botanical and chemical characteristics and identified as *M. crispata*. The composition of its essential oil is shown in a chromatogram and in a table. The main component was carvone (59.62%), followed by dihydrocarvyl acetate (8.44), dihydrocarvone (4.50), dihydrocarveol (4.17), limonene (3.81), dihydrocarveol (3.41) and caryophyllene (2.52). Owing to the large concn. of carvone its organoleptic character did not differ greatly from that of *M. longifolia* var. *crispa*. RM

244

Preliminary gas chromatographic analysis of flavor compounds in mayonnaise.

Min, D. B.; Tickner, D. B.

Journal of the American Oil Chemists' Society 59 (5) 226-228 (1982) [6 ref. En][Dep. of Food Sci. & Nutr., Ohio Agric. Res. & Development Cent., Ohio State Univ., 2121 Fyffe Road, Columbus, Ohio 43210, USA]

The flavour compounds in fresh, 3- and 6-month-old mayonnaise (stored at room temp.) were analysed by a gas chromatographic method. The results indicate that as the storage time of mayonnaise increased, the flavour compounds formed from oil in mayonnaise increased. However, the concn. of allyl isothiocyanate (the major flavour compound of mustard), and acetic acid and ethyl acetate (the major compounds in vinegar) did not change during 6 months' storage at room temp. The analytical method described showed good reproducibility for analysis of mayonnaise flavour compounds and could be used as an instrumental analytical method to evaluate mayonnaise flavour quality and complement sensory evaluation of mayonnaise. AS

245

[Volatile compounds formed on roasting L-theanine with D-glucose.]

Hara, T.

Journal of the Agricultural Chemical Society of Japan [Nihon Nogei Kagakkai-shi] 55 (11) 1069-1072 (1981) [10 ref. Ja, en][Nat. Res. Inst. of Tea, Kanaya, Haibara, Shizuoka 428, Japan]

A mixture of L-theanine (γ -glutamylethylamide) and D-glucose was roasted at 150-160°C for about 1 h. From the condensate of volatile components, the main product (1-ethyl-3,4-dehydropyrrolidone), 5 pyrroles, 3 alkyl pyrazines and 4 furans were identified by spectroscopic methods (MS and NMR) and gas chromatography. A pathway for the formation of the main product from L-theanine is proposed. AS

246

[Aroma of food:.] (In 'Problemy kachestva i biologicheskoi tsennosti pishchevykh produktov' [see FSTA (1982) 14 11G722])

Simonova, V. N.; Antonov, N. A.

pp. 68-77 (1979)[Ru][Leningradskii Inst. Sovetskoi Torgovli im. F. Engel'sa, Leningrad, USSR]

Generally accepted methods for extraction of volatile aroma compounds from foods are outlined. The GLC method used to study aroma compounds obtained by vacuum distillation from (i) beef, (ii) cold-smoked mackerel, and (iii) soluble coffee is described in detail. Chromatograms of the 3 products are presented. Some 60 peaks were detected in (i) chromatogram on the 'Tsvet-104' instrument, but their identification is considered difficult. (ii) showed some 65 peaks on the LKhM-8MD 4 instrument, and identification of the phenolic fraction is tabulated, proportions of 15 named compounds and 6 not identified being presented. The 'Tsvet-1 64' instrument was used for (iii). Carbonyl compounds predominated; 17 identified peaks are named, 1 was not identified. SKK

247

[Free fatty acids and neutral volatiles in cheese-like soy protein food using *Saccharomyces fragilis* as a starter.]

Kawaguchi, Y.; Matsuoka, H.;

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 28 (1) 8-13 (1981) [13 ref. Ja, en][Yamanashi Prefectural Agric. & Forestry High School, Nishiyahata Ryuo-cho, Nakakoma-gun, Yamanashi-ken, 400-01 Japan]

Levels of free fatty acids and neutral volatiles (aldehydes, ketones, alcohols and esters) were determined in an experimental cheese-like soy protein food by gas chromatography. Free fatty acids reached a max. level of 33 mg/g after 30 days ripening, but volatiles continued to increase throughout 40 days ripening. [From En summ.] JRR

248

[Gas chromatographic determination of beer aroma substances.] Gaschromatographische Bestimmung von Bieraromastoffen.

Narziss, L.; Miedaner, H.; Schöndorfer, H.

Brauwissenschaft 35 (5) 109-113 (1982) [26 ref. De, en, fr][Lehrstuhl & Lab. für Brauerei I, Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

Methods for GLC analysis of beer aroma compounds are described including: analysis of aroma compounds in methylene chloride extracts of beer distillates by GLC on a Carbowax 20M column; analysis of a

methylene chloride/pentane (1:2) extract of a steam distillate of beer by gas chromatography on Carbowax 20M and OV-101 capillary columns, with MS identification; and detn. of free C2-C12 fatty acids by gas chromatography on a Carbowax 20M capillary column, after separation of the fatty acids by a procedure involving steam distillation, extraction with diethyl ether, re-extraction with KOH, and re-extraction into diethyl ether. Tables of data for compounds identified in beers by these methods are given. AJDW

249

[Utilization of Tenax GC column trapping technique for gas-chromatographic analysis of headspace volatiles from satsuma mandarin juice (*Citrus unshiu* Marc.).]

Kaneko, K.; Imai, T.; Katayama, O.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 27 (8) 407-410 (1980) [10 ref. Ja, en] [Nat. Food Res. Inst., Min. of Agric., Forestry & Fisheries, 2-1-2 Kannondai, Yatabe-machi, Tsukuba-gun, Ibaraki-ken, 305 Japan]

Mandarin juice volatiles were trapped on a Tenax GC column and released by heating for gas chromatographic analysis. The trapping technique reduced trapping time and enhanced concn. of volatiles, thus improving the detection and resolution of the chromatogram, but it also easily absorbed volatiles from the air, and failed to absorb some volatile components, such as ethanol. [From En summ.] JRR

250

Some aspects of dimethyl sulfide in beer.

Matsui, S.

Bulletin of Brewing Science 26, 9-16 (1980) [25 ref. En] [Asahi Breweries Ltd., Tokyo 143, Japan]

Dimethyl sulphide (DMS) concn. were determined in various brands of commercial beers (lagers, stouts, dark beers) during 3 yr, using GLC with flame photometric detection. The results showed that DMS levels tended to be constant in most brands, irrespective of the yr. DMS levels did not rise during 3 wk storage of bottled beer at 3° or 25°C, but increased at 45° and 60°C. Marked rise was observed during 10 days storage at 60°C of unboiled sweet wort and some rise during lagering while DMS concn. in pitching wort was almost constant. In commercial brewing, some rise in DMS concn. was observed during the holding of boiled wort in the hot wort receiver, and also during fermentation and lagering. Results suggest that a heat-labile precursor is produced by yeast during fermentation or lagering, and that its heat decomposition is responsible for part of the DMS formed during high-temp. storage of bottled beer. RM

251

[Formation of aroma compounds by the Maillard reaction.] Bildung von Aromastoffen durch

Maillardreaktion. (In '9th International Scientific Colloquium on Coffee' [see FSTA (1982) 14 11H1751])

[Lecture]

Tressl, R.

pp. 55-76 (1980) [50 ref. De] [Forschungsinst. für Chem.-Tech. Analyse, Tech. Univ. Berlin, Seestrass 13, D-1000 Berlin 65]

Formation of aroma compounds by the Maillard reaction during roasting of coffee is discussed, with reference to results of studies on coffee, malt and model systems. Aspects considered include: formation of furans; formation of caramel components; formation of aroma components from Stecker aldehydes; formation of N-containing heterocyclic compounds from proline and hydroxyproline; formation of aldimines, amines and pyrroles; formation of S-containing furan derivatives; and formation of pyrazines, thiazoles and oxazoles. AJDW

252

[Model studies on aroma formation in coffee.]

Modelluntersuchungen über die Aromabildung in Kaffee. (In '9th International Scientific Colloquium on Coffee' [see FSTA (1982) 14 11H1751]) [Lecture] Herrmann, G.; Baltes, W.

pp. 77-85 (1980) [8 ref. De] [Inst. für Lebensmittelchem., Tech. Univ. Berlin, Müller-Breslau-Strasse 10, D-1000 Berlin 12]

Sucrose was heated with twice the molar quantity of serine + threonine at 225°C, and volatile reaction products were analysed by glass-capillary gas chromatography coupled with MS. Overall, 400 components were separated, the combined sensory impression being a sharp 'roasted' aroma. 120 components were identified, including pyrazines, pyridines, pyrroles, quinoxalines, furans and an oxazole. Pyrazine derivatives comprised 80-85% of the total; pyrrole derivatives were also present in appreciable quantities. Pyridine compounds comprised <0.5% of the total. AJDW

253

Flavour retention during freeze-drying of coffee. (In '9th International Scientific Colloquium on Coffee' [see FSTA (1982) 14 11H1751]) [Lecture]

Fosbol, P.; Petersen, E. E.

pp. 251-266 (1980) [22 ref. En] [A/S Atlas, Copenhagen, Denmark]

Coffee extract was frozen in a 1-stage or a 2-stage process, ground, and freeze-dried at 2 layer thicknesses (2 or 12-13 mm, corresponding to drying times of 0.5 or 6 h). Samples were stored in tins at ambient temp. in N₂ for 6 months, until analysis of volatile and flavour compounds by gas chromatography. Organoleptic evaluation of all samples was done by a trained panel using a 1 = excellent to 5 = unsatisfactory scale. Statistical analysis of results is presented. It was concluded that the processes had little effect on overall volatile retention, but that retention of the most volatile components increased if the freezing rate and ice front temp. were decreased, and if the drying rate was increased. LH

254

[Changes in quality of roasted Arabica coffee stored in four model packs. Sensory analysis - evolution of the volatile fraction. Comparison with a standard. Limits to optimal use.](In '9th International Scientific Colloquium on Coffee' [see FSTA (1982) 14 11H1751]) [Lecture]

Cros, E.; Fourny, G.; Guyot, B.; Rouly, M.; Vincent, J.-C. pp. 345-352 (1980) [5 ref. Fr] [Lab. de Chimie-Tech. de l'IFFC, BP 5035, 34032 Montpellier Cedex, France]

Studies were conducted on changes in roasted Arabica coffee during storage for ≤ 40 wk (i) in bulk in a glass container open to the air; (ii) in air in a metallized pack (simulating normal packaging); (iii) in vacuum packaging, otherwise as for (ii); and (iv) in an Al foil/plastics laminate pack with a 1-way exhaust valve. The stored samples were evaluated by headspace GLC and by sensory testing. The results show that (iv) gave the best sensory quality retention, followed by (iii); (i) was poorest. Changes in volatiles were dependent on storage time. The volatiles composition of (ii), (iii) and (iv) was approx. identical after 2 months' storage. Volatiles composition was related to organoleptic evaluation of aroma. AJDW

255

[Gas chromatographic determination of glycerol and 2,3-butanediol in wine.] Gaschromatographische Bestimmung von Glycerin und 2,3-Butandiol in Wein. Postel, W.; Adam, L.; Rustler, M.

Deutsche Lebensmittel-Rundschau 78 (5) 170-172 (1982) [16 ref. De, en, fr] [Inst. für Lebensmitteltech. & Analytische Chem., Tech. Univ. München, 8050 Freising-Weihenstephan, Federal Republic of Germany]

A rapid, simple method for detn. of (i) glycerol and (ii) laevo- and (iii) meso-2,3-butanediol in wine is described. The wine sample is diluted 1:1 with distilled water, 2,5-hexanediol (internal standard) is added, and the diluted wine is injected directly onto a 5% Ucon LB 550X on Chromosorb G-AW-DCMS column equipped with a flame ionization detector. Analyses of wines showed s.d. of (i) ± 0.16 g/l, (ii) ± 7.9 mg/l and (iii) ± 5.1 mg/l; and variation coeff. of (i) $\pm 1.9\%$, (ii) $\pm 3.0\%$ and (iii) $\pm 4.5\%$. Agreement with chemical and enzymic methods was good. Approx. 69% of the 2,3-butanediol

present in wines was in the laevo form. This method may also be used for detn. of 1-propanol, isobutanol, isoamyl alcohol, ethyl lactate and 2-phenyl ethanol. AJDW

256

[Some neutral volatile compounds of botrytised wine.]

Yunome, H.; Nishimura, K.; Masuda, M.; Zenibayashi, Y.; Ohkawa, E.

Hakkokogaku Kaishi 59 (2) 177-184 (1981) [4 ref. Ja, en] [Cent. Res. Inst., Suntory Ltd., Wakayamadai 1-1-1, Shimamoto-cho, Mishima-gun, Osaka 618, Japan]

Volatile neutral compounds from botrytised and normal wines of grapes from Japanese Riesling and Semillon vines, and similar wines from Germany and France were analysed by liquid-liquid extraction, glass capillary gas chromatography and gas chromatography-MS. 143 flavour compounds were identified, 34 of which showed different levels in

botrytised vs. normal wines. Similar results were obtained for Japanese, German and French wines. Normal wine could be made to taste similar to botrytised wine by adding 13 volatile and 5 nonvolatile compounds characteristic of botrytised wines. [From En summ.] LH

257

Neutral volatile components in wines of Koshu and Zenkoji grapes.

Shimizu, J.; Watanabe, M.

Agricultural and Biological Chemistry 45 (12) 2797-2803 (1981) [24 ref. En] [Cent. Res. Lab. of Kikkoman

Corp., 399-Noda, Noda-shi, Chiba 278, Japan]

Volatile components of wines made from the native Japanese grapes, Koshu and Zenkoji (*Vitis vinifera orientalis*), as isolated from dichloromethane extracts, were studied by capillary gas chromatography-MS. Aroma of whole dichloromethane extracts closely resembled original wine aroma. 35 volatile components of Koshu wine and 40 of Zenkoji wine were identified; 2-methoxy-5-vinylphenol, present in both, was identified for the 1st time as a wine component. Total volatiles were fractionated into acidic, weakly acidic, basic and neutral fractions; the neutral fraction had a very similar aroma to the original wine (when assessed in 10% ethanol solution), whereas none of the other fractions did. Compounds identified in neutral fraction of Koshu and Zenkoji wines are tabulated; in general each contained the same components, but Koshu wine contained a large amount of terpinen-4-ol and a trace of linalool, whereas Zenkoji wine only contained a small amount of terpinen-4-ol and no other terpenic compounds. DIH

258

[Identification of 3,7-dimethylocta-1,7-diene-3,6-diol in grape and wine aroma of muscat varieties.]

Identifizierung von 3,7-dimethyl-okta-1,7-dien-3,6-diol im Trauben und Wein aroma von Muskatsorten.

Rapp, A.; Knipser, W.; Engel, L.

Vitis 19 (3) 226-229 (1980) [5 ref. De, en]

[Bundesforschungsanstalt für Rebenzüchtung Geilweilerhof, 6741 Siebeldingen, Federal Republic of Germany]

Glass capillary gas chromatography/MS analysis was used to identify the title compound in aroma extracts prepared from juice and wines of muscat grapes for the first time. The terpenediol was found in Blauer Muskateller, as well as the new var. Schönburger, Morio-Muskat and Sieger, but has not so far been identified in non-muscat grapes. Its contribution to muscat aroma is thought to be insignificant, although it may be a precursor of the aroma compound 2-methyl-2-vinyl-5-isopropylpentyltetrahydrofuran. Terpenoid compounds identified in Blauer Muskateller grapes are listed. DIH

259

Examination of the volatile carbonyl fraction of fresh tomatoes and tomato preparations. I. Thin-layer chromatographic separation.

Petro-Turza, M.; Szarföldi-Szalma, I.

Acta Alimentaria 11 (1) 75-86 (1982) [9 ref. En]

[Central Food Res. Inst., H-1022 Budapest, Hermann Otto ut 15, Hungary]

A method was developed for extraction and TLC separation of volatile carbonyl compounds present in tomatoes and tomato preparations. Steam distillation, followed by precipitation with 2,4-dinitrophenylhydrazine (DNPH) was used for the extraction of the volatile carbonyl compounds. After washing and drying, the precipitate was dissolved in ethyl acetate, followed by TLC separation of the carbonyl DNPH fraction on Kieselgel G with developing solvent diethylamine/pyridine/water (70:29.5:0.5 by vol.). Five carbonyl classes could be distinguished: aliphatic monoketones, aliphatic monoaldehydes, unsaturated monocarbonyls, cyclic and aromatic carbonyls, and dicarbonyls. Separations were repeated on 30 preparative plates (0.75 mm thick); the fractions were combined and rechromatographed in another TLC system. Certain compounds could be tentatively identified on the basis of the R-value and spot colour of known carbonyl DNPH-s co-chromatographed by the samples. 39 carbonyl compounds could be detected, 25 of them identified by the above method in fresh tomatoes and tomato preparations. It was concluded that processing, i.e. production of tomato puree and powder changed the volatile carbonyl profile of fresh tomatoes significantly. While the monoaldehyde fraction (and mostly 2-hexenal) was dominant in fresh tomatoes, the cyclic carbonyls (and mostly furfural) and the dicarbonyls accounted for the major part of the total carbonyl content in tomato puree and powder. Also, the amount of unsaturated mono-carbonyls decreased significantly in the latter samples. Obviously, the different volatile carbonyl profiles contribute to the observed differences in the flavour of fresh and processed tomatoes. AS

260

Examination of the volatile carbonyl fraction of fresh tomatoes and tomato preparations. II. High performance liquid-chromatographic separations.

Varga-Puchony, Z.; Vigh, G.; Hlavay, J.; Petro-Turza, M.; Szarföldi-Szalma, I.

Acta Alimentaria 11 (1) 103-115 (1982) [7 ref. En] [Inst. for Analytical Chem., Univ. of Chem. Engineering, H-8200 Veszprem, Schönherz Z. u. 12., Hungary]

As part of a study of objective monitoring of processing-induced changes in tomato aroma and flavour, carbonyl compounds were isolated as 2,4-dinitrophenylhydrazones (DNPH) and partially fractionated by TLC [see part I, preceding abstr.]. HPLC separation of the following 3 TLC fractions was investigated: aliphatic monoketone DNPH, aliphatic monoaldehyde DNPH, unsaturated monocarbonyl DNPH. Reversed-phase HPLC column was μ Bondapak C-18 with methanol/water, 79.34:20.66 (v/v) eluent. DNPH were detected at 360 nm. HPLC chromatograms of the 3 carbonyl fractions from fresh tomatoes, tomato

puree and powdered tomato are illustrated, and peak elution vol. and tentative identification are tabulated. Many differences were noted between chromatographs of fresh tomato and processed product DNPH; in particular the predominant peak in the unsaturated aldehyde DNPH fraction of fresh tomato was *trans*-2-hexenal; this has a characteristic 'fresh fruit/vegetable' odour. Content of this in the processed products was markedly reduced. DIH

261

Aroma constituents of some sour citrus oils.

Kusunose, H.; Sawamura, M.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 27 (10) 517-521 (1980) [7 ref. En, ja] [Dep. of Agric. Chem., Fac. of Agric., Kochi Univ., Nankoku, Kochi, 783 Japan]

The essential oils of sumikan, a cv. of *Citrus aurantium*; naoshichi, *C. tagomasudachi*; and yuzu, *C. junos*, were analysed by gas chromatography and MS. The peak area % of the hydrocarbons and the oxygenated compounds among the aroma constituents identified were: 99.3% and 0.45% for sumika, 99.4% and 0.49% for naoshichi, and 90.6% and 8.74% for yuzu. It is suggested that the terpenic hydrocarbons may contribute largely to the characteristic odour of sumikan and naoshichi. Myrcene was a notably large component (24.3% peak area) of sumikan. The larger levels of oxygenated compounds (alcohols and carbonyls) in yuzu are probably responsible for its characteristic and complex odour. AS

262

Volatile flavor components of sapodilla fruit (*Achras sapota* L.).

MacLeod, A. J.; Gonzales de Troconis, N.

Journal of Agricultural and Food Chemistry 30 (3) 515-517 (1982) [12 ref. En] [Dep. of Chem., Queen Elizabeth Coll., Univ. of London, Campden Hill Road, London W8 7AH, UK]

Essence of fresh sapodilla fruit was obtained by well-established procedures, and it possessed the characteristic aroma of the fruit. It was analysed by GC-MS with both EI and CI techniques. The fruit produced a relatively small quantity of aroma volatiles (in total about 5 μ g/kg fresh fruit), less than that obtained from most similar fruits, and this partly explains its delicate flavour. A group of "benzyl-related" compounds comprised >45% of the essence, and included a series of 5 alkyl benzoates. Methyl benzoate and methyl salicylate were both described as having sapodilla fruit aroma on odour evaluation of separated components at an odour port at the exit of the GC column. Ethyl benzoate and propiophenone had related aroma characteristics. AS

263

[Studies on the odour-producing substances in foul-smelling canned satsuma mandarins.]

Miyahara, S.; Nishimura, K.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 27 (8) 397-400 (1980) [7 ref. Ja, en] [Lab. of Fisheries Chem., Fac. of Fisheries, Nagasaki Univ., Bunkyo-machi, Nagasaki-shi, Nagasaki-ken, 852 Japan]

Gas chromatography-MS revealed that cans containing mandarins with an off-odour contained 1-chlorobutane and chlorobenzene, the origin of which was as impurities in the HCl used in the removal of the segment membranes. Addition of these chemicals to normal canned fruit duplicated the foul smell. [From En summ.] JRR

264

Effect of fermentation on volatile acids and ethanol in Swedish dairy products.

Alm, L.

Journal of Dairy Science 65 (2) 186-190 (1982) [34 ref. En] [Mjölkccentralen Arla, S 105 46 Stockholm, Sweden]

Acetic, propionic and butyric acids in Swedish fermented milk products were measured by steam distillation followed by GLC, and ethanol content was measured by an enzymic method. Acetic acid was low in yoghurt (< 20 mg/100 g) but high in bifidus milk (about 650 mg/100 g); other products showed intermediate acetic acid concn., approx. 120 mg/100 g in acidophilus milk and approx. 70 mg/100 g in buttermilk. Propionic and butyric acid contents were low in all products investigated. Ethanol content of Swedish fermented products was low except for kefir, which contained approx. 20 mg/100 g initially and 200 mg/100 g after 11 days storage. AS

265

Volatile flavor components of dried bonito (katsuobushi). I. On basic, acidic and weak acidic fractions.

Yajima, I.; Nakamura, M.; Sakakibara, H.; Yanai, T.; Hayashi, K.

Agricultural and Biological Chemistry 45 (12) 2761-2768 (1981) [16 ref. En] [Kawasaki Res. Lab., T. Hasegawa Co., 335-Kariyado, Nakahara-ku, Kawasaki 211, Japan]

Volatile compounds in katsuobushi, a traditional Japanese flavour enhancer, were studied by distilling aqueous extracts of katsuobushi under reduced pressure, extracting the distillate with diethyl ether and concentrating this ether extract. The flavour concentrate was divided into basic, acidic, weakly acidic and neutral fractions by successive partitioning against 5% HCl, 5% NaHCO₃ and 5% NaOH. Fractions were analysed by GLC using open tubular columns coated with PEG 20M and with flame ionization and flame photometric detection, and by GLC-MS. A total of 320 mg of flavour compounds was obtained from 10 kg starting material, which was made up as follows: basic 3%, acidic 2%, weakly acidic 52%, neutral 43%. The neutral fraction remains to be analysed in detail; in the remaining fractions, 74 flavour compounds were identified, 36 for the 1st time as katsuobushi constituents. 8 pyridines, 7 pyrazines and 5 thiazoles were identified in the basic fraction, 7, 7 and 5, resp. for the 1st time in katsuobushi; quinoline and isoquinoline were also present. Most compounds in the weakly basic fraction possessed roasted or fishy odour. The weakly acidic fraction possessed the characteristic smoky aroma of katsuobushi, but none of the 25 individual phenolic compounds that made up this fraction (3 identified for the 1st time) individually had this aroma, and it is concluded that katsuobushi aroma results from the combination. The acidic fraction had a pungent acidic aroma. Components were identified after methylation; 23 were identified, 15 for the 1st time

in katsuobushi. In addition, the flame photometric detector indicated the presence of S-containing compounds, but these were not present in sufficient quantity to be identified. DIH

266

[Studies on the volatile components of wasabi and horse radish. I.]

Ina, K.; Sano, A.; Nobukuni, M.; Kishima, I.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 28 (7) 365-370 (1981) [7 ref. Ja, en] [Dep. of Agric. Chem., Shizuoka Univ., 836 Ohya, Shizuoka 422, Japan]

Volatile components of wasabi (*Wasabi japonica*) and horse radish (*Cochlearia armoracia*) were studied by gas chromatography and MS. The main volatile component of both spp. was allyl isothiocyanate, while horse radish contained relatively large amounts of β -phenylethyl isothiocyanate as a radish-like flavour component. GC analysis did not isolate a typical flavour compound for wasabi, but the characteristic odour was produced by allyl isothiocyanate in methanol solution, giving an odour of allyl sulphides on heating. [From En summ.] JRR

267

Natural flavouring materials.

Bader, P.

Cereal Foods World 26 (6) 281-283 (1981) [En]

[Naarden International, Inc., Owings Mills, Maryland, USA]

The range of natural materials which are permitted to be used as flavouring materials in foods in the USA are surveyed, with particular reference to essential oils and oleoresins. JRR

268

Qualitative evaluation of aromatic herbs by direct headspace (GC)² analysis. Methodology and some preliminary applications.

Gabri, G.; Chiava, F.

Journal of High Resolution Chromatography and Chromatography Communications 4 (5) 215-217 (1981) [4 ref. En] [Martini & Rossi SpA, I-100 20 Pessioneto, Italy]

A simple, quick method is described for GLC headspace analysis of herbs and drugs. Weighed samples are milled in a blender (a Braun Multimix MX32 glass coffee grinder) fitted with a gas-tight valve to allow direct withdrawal of headspace samples for GLC analysis. Applications illustrated by chromatograms are given for *Artemisia absinthum*, coriander, savory, and some 'difficult' herbs, i.e. *Teucrium chamaedrys*, *Cnicus benedictus*, *Hypericum perforatum*. The method adapts well to routine control of aromatizing herbs. RM

269

[Studies on the volatile components in 'wasabi' powder. II. A method of checking the quality of Japanese horse-radish and black mustard in wasabi powder.]

Kishima, I.; Fukuzawa, K.; Imai, S.; Ina, K.

Journal of Japanese Society of Food Science and Technology [Nippon Shokuhin Kogyo Gakkaishi] 27 (12) 591-596 (1980) [8 ref. Ja, en] [Kinjirushi Wasabi Co. Ltd., Nakagawa-ku, Nagoya, Aichi, 454 Japan]

Volatile components in hydrolysates of horseradish and black mustard flour were investigated by gas chromatography. 3-methylpropyl isothiocyanate and β -phenylethyl isothiocyanate were detected as critical components in both materials. The peak area of the former compound was greater in black mustard than in horseradish, and the converse was true for the latter compound. The ratio of black mustard to horseradish powder in wasabi powder can thus be estimated from the ratio of the peak areas of these 2 compounds in gas chromatographic analysis. [From En summ.] JRR

270

Glass capillary chromatographic profiles of soy sauce aroma correlated with sensory assessment.

Aishima, T.

Agricultural and Biological Chemistry 45 (12) 2847-2853 (1981) [22 ref. En] [Noda Inst. for Sci. Res., Noda-shi, Chiba 278, Japan]

The relationship between soy sauce gas chromatographic (GC) patterns precisely analysed on a glass capillary column and ranked order in sensory analysis was investigated by stepwise multiple regression analysis. The most negative and positive correlation between the GC peaks and sensory data were shown by *trans*-2-hexen-1-ol contributing to preferable aroma and iso-butyric acid to unpleasant smell, resp. Highly predictive multiple regression models were calculated in the analysis. The variety of volatile components selected for the equations indicated that these constituents represented not only different groups of chemical structures in aroma compounds but also growth of various microorganisms during the soy sauce making process. AS

271

[Volatile components in polypropylene containers.]

Kato, K.; Osada, Y.; Nakaoka, T.; Ikeda, H.

Journal of the Food Hygienic Society of Japan

[*Shokuhin Eiseigaku Zasshi*] 22 (5) 386-390 (1981)

[6 ref. Ja, en] [Kanagawa Prefectural Public Health Lab.,

52-2 Nakao-cho, Asahi-ku, Yokohama, Japan]

The volatile components in 22 samples of commercial PP (polypropylene) containers were identified and determined by gas chromatography. Volatile compounds from PP resins could be classified into 2 groups: saturated C6 hydrocarbons (detected in 6 samples), and saturated C7 hydrocarbons (detected in 16 samples). In the group of C6 compounds, n-hexane was the main component, whereas the C7 compounds were a mixture of 2-methylhexane, 3-methylhexane, n-heptane and methylcyclohexane. PP resins, analysed by extraction into toluene, contained 15-23 p.p.m. C6 hydrocarbons vs. 34-343 p.p.m. C7 hydrocarbons. TM

272

Technology and flavor chemistry of passion fruit juices and concentrates. [Review]

Casimir, D. J.; Kefford, J. F.; Whitfield, F. B.

Advances in Food Research 27, 243-295 (1981) [110 ref. En] [Div. of Food Res., CSIRO, North Ryde, NSW, Australia]

Aspects considered in this extensive review include:

extraction of passion fruit pulp, removal of starch, preservation of pulp and juice, chemical composition of juice; concentration of passion fruit juice (selection of evaporators, effects of concn. on quality, recovery and restoration of volatile flavouring constituents, concn. by reverse osmosis, and passion fruit juice powders); chemistry of volatile flavouring constituents (general composition, including a table showing occurrence and concn. of constituents in juice of purple and yellow passion fruits, unusual volatile flavours in passion fruits, flavour impact values, and effects of var., maturity and processing); and needs and applications for research and development. AL

273

Volatile components identified in the acidic fractions of wines from Kosu and Zenkoji grapes.

Shimizu, J.; Watanabe, M.

Agricultural and Biological Chemistry 46 (5) 1377-1380 (1982) [7 ref. En] [Cent. Res. Lab. of Kikkoman Corp., 399-Noda, Noda-shi, Chiba 278, Japan]

A volatile concentrate was prepared from Kosu and Zenkoji wines by extraction with dichloromethane. This was extracted by 3% Na₂CO₃ solution and acidic compounds were back-extracted into dichloromethane after the aqueous layer was adjusted to pH 1.5. The compounds present in the acidic fraction were identified by capillary gas chromatography-MS. Compounds identified are tabulated. 12 acids were identified in both wines; in addition to acids the acidic fraction contained alcohols, esters, lactones, carbonyls and other compounds, 26 in Kosu and 20 in Zenkoji wine. 9 of these compounds were identified for the 1st time as wine volatile components; all were present in Kosu wine and 6 in Zenkoji wine. DIH

274

[Behaviour of volatile substances and lipids of apples during cold storage.] Verhalten flüchtiger Bestandteile und Lipide von Äpfeln während der Kühlungslagerung. Neubeller, J.; Buchloh, G.; Dhuria, H. S.

Mitteilungen Klosterneuburg, Rebe und Wein,

Obstbau und Früchteverwertung 29 (5) 227-233

(1979) [7 ref. De, en, fr] [Inst. für Obst-, Gemüse- & Weinbau der Univ. Hohenheim, Postfach 106, D-7000 Stuttgart-Hohenheim, Federal Republic of Germany]

Liberation of aroma substances/cm² of fruit surface was examined during storage. Volatile aroma substances reach max. liberation between 15 Nov. and 27 Dec. with var. Golden Delicious and Jonathan, as $\mu\text{l}/\text{cm}^2$ of the fruit surface; the production rate decreases towards the end of storage. In gas-chromatographic analysis >60 components could be separated with a normal 7-m packed column. The 6 main components were hexyl acetate, iso-amyl acetate, ethyl butyrate, butyl acetate, ethyl valerate and butyl butyrate. Production rates of these main components were monitored from beginning to end of storage and they were quantitated gas chromatographically. C1-C8 fatty acids were found in the aroma substances and C10-C20 in apple peel. Contrary to hypobaric and controlled-atm store, normal cold storage gave fruit with good taste characteristics, i.e. full aroma typical of var. AS

275

Changes in volatile flavour components of soybeans during roasting.

Kato, H.; Doi, Y.; Tsugita, T.; Kosai, K.; Kamiya, T.; Kurata, T.

Food Chemistry 7 (2) 87-94 (1981) [15 ref. En] [Dep. of Agric. Chem., Univ. of Tokyo, Bunkyo-ku, Tokyo, Japan]

Volatile concentrates were prepared from whole soybeans, roasted at 200°C for 10, 20 and 30 min, by steam distillation under reduced pressure followed by ether extraction, and analysed by GLC and GLC-MS. Results were compared with the volatile concentrate from raw soybean flour. Major flavour components of raw soybean, such as n-hexanol, 1-octen-3-ol and n-hexanal, decreased during roasting, but the rate of this decrease was not rapid, especially between 10 and 20 min roasting. During roasting alkylated pyrazines, oxygenated furans, oxygenated pyrroles and phenols were formed or increased markedly. Sensory evaluation showed that a flavour change to 'desirable' from 'beany' or 'objectionable' occurred between 10 and 20 min roasting. These results suggest that roast flavour masks the 'beany' flavour in soybean. AS

276

Quantitative analysis of cold-pressed lemon oil by glass capillary gas chromatography.

Staroscik, J. A.; Wilson, A. A.

Journal of Agricultural and Food Chemistry 30 (3) 507-509 (1982) [5 ref. En] [Products Res. & Development Div., Sunkist Growers, Inc., Ontario, California 91761, USA]

Cold-pressed lemon oil, a commercial blend of California and Arizona oils, was analysed quantitatively by glass capillary gas chromatography. The oil had 24% citral by the hydroxylamine method. Gas chromatographic conditions were: 60-m glass column coated with SE-54, with He carrier gas, inlet temp. 250°C, oven temp. 85°C initially, then raised to 230°C, flame ionization detection. 37 components were quantitated by using a weighed calibration mixture of each component obtained in pure form, and methyl myristate as internal standard. Peak assignment was by peak enhancement. Conc. of the 37 components in lemon oil are tabulated as wt. %; 6 (α -thujene, 3-carene, octanol, nerol, geraniol, nonyl acetate) have not previously been quantitated in lemon oil. Of the remainder, 15 were present at concn. below the ranges previously reported in the literature. Neryl acetate was present at 0.50 wt.%, i.e. above the highest previously reported concn. Total citral (neral + geranial) content was 1.98%; total aldehyde content was 2.3%, which agrees well with the nonspecific hydroxylamine detn. DIH

277

Volatile compounds in cereals: separation and condensation for chromatographic analysis and description of their aromatic characteristics.

Kaminski, E.; Wasowicz, E.; Przybylski, R.

Acta Alimentaria Polonica 7 (1/2) 59-72 (1981) [29 ref. En] [Inst. of Plant-Origin Food Tech., Agric. Univ., Poznan, Poland]

A technique is described for distillation, separation (2 h) of volatiles and subsequent concn. in N_2 of golden

rye, rye malt (initial roasting 135°C, final roasting 210°C) and whole meal rye bread; the condensed extracts were obtained in sufficient amounts for GLC and MS analysis. Details of techniques are presented, with diagrams of the apparatus. Other workers have reported 100% recoveries for distillation extraction; in this work some compounds were lost during concn. and recoveries were 70% for most compounds and 60% for some esters. Nevertheless, the results were highly repeatable, and some compounds were identified which had not previously been detected. 57 volatiles were found in rye bread (chromatograms are given and peaks obtained related to aroma characteristics). Only 2 of the aromas found corresponded to a typical bread aroma; other recurrent aromas were fruity, floury, potato-like and sour. ELC

278

[Composition of the volatile basic N fraction (TVB-N) in acid extracts and alkaline distillates from sea fish fillets.] Zur Zusammensetzung der TVB-N-Fraktion (flüchtige Basen) in sauren Extrakten und alkalischen Destillaten von Seefischfilet.

Rehbein, H.; Oehlenschläger, J.

Archiv für Lebensmittelhygiene 33 (2) 44-48 (1982) [many ref. De] [Bundesforschungsanstalt für Fischerei, Hamburg, Federal Republic of Germany]

The composition of the TVB-N fraction was determined in freshly caught fish and after up to 20 days' storage. Tabulated data show that it contained mainly ammonia, with increasing amounts of tri- and dimethylamine appearing during storage. The concn. of the individual amines were dependent on the spp. (fresh trout, carp, and cod, ice-stored saithe and redfish), the freshness of the fish, and the distillation method used. 10-20 mg ammonia N/100 g were found in perchloric acid extracts of homogenized fillets. Comparison of the ammonia contents of acid extracts with alkaline distillates showed that the deamination during distillation was greatly influenced by the fish material. The meaning of the TVB-N value is discussed and a procedure proposed for optimizing the distillation conditions. [From En summ.] RM

279

[Volatile components of smoked sardine.]

Kasahara, K.; Nishibori, K.

Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 47 (1) 113-119 (1981) [2 ref. Ja, en] [Notre Dame Seishin Univ., Okayama 700, Japan]

To examine the masking effect of smoke flavour on the undesirable odour characteristic of cooked sardine, the volatiles of the smoked sardine were compared with those of raw sardine and the non-smoked dried sardine by organoleptic test, GLC, and gas chromatography-MS analyses. In organoleptic test, most of the panel members could not detect the undesirable sardine odour in the smoked sample and preferred the smoked sardine flavour. In GLC and gas chromatography-MS analyses, 39 volatile components (9 carbonyls, 3 alcohols, 16 phenols, 2 esters and 9 hydrocarbons) from the smoked sardine, 9 hydrocarbons from raw

sardine, and 18 volatiles (8 carbonyls, 2 alcohols and 8 hydrocarbons) from dried sardine were identified. In the smoked sardine, phenolic volatiles were considered to play an important role in masking the undesirable odour of the sardine. AS

280

Quality properties of caraway seed from various sources.

Kuusi, T.; Tenhunen, J.; Hirvi, T.; Suihko, M.

Elelmiszervizsgálati Közlemények 27 (5/6) 281-290 (1981) [19 ref. En, hu, de, ru] [Food Res. Lab., Otaniemi, 02150 Espoo, Finland]

The sensory method of threshold assessment gave good indication of aroma and taste of the caraway seeds examined and revealed the existence of differences between the various samples obtained from Switzerland, Germany, Poland and Finland (both cultivated and wild.). Data are given for % impurities, 1000-seed wt., moisture, ash, acid-insoluble ash, volatile oil, and carvone contents and carvone/limonene ratio of the seed, odour detection thresholds and flavour profiles of the seed oils. Wild Finnish caraway seed had the smallest seeds but highest volatile oil content; it also tended to have the lowest carvone content, and an average flavour threshold value. Typical caraway flavour was greatest in aged samples. AJDW

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